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# NAVAL POSTGRADUATE SCHOOL

## Monterey, California



## THESIS

### ENLISTMENT AND RETENTION IN THE 1979 AND 1988 NAVY COHORTS

by

Jui-Fu Hu

March, 1995

Principal Advisor:

Associate Advisor:

William R. Gates

Julie Dougherty

Thesis  
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ENLISTMENT AND RETENTION IN THE 1979 AND 1988 NAVY COHORTS

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Submitted in partial fulfillment of the  
requirements for the degree of

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## ABSTRACT

This thesis examines the 1979 and 1988 cohort files. The cohort files are maintained by the Defense Manpower Data Center, and contain a total of 365 variable fields to record information about personnel who enlist in a given year. Significant variables among the total are identified, and frequency analysis is performed. Additionally, the significant variable category values are cross-tabulated with reenlistment statistics, to obtain information about reenlistment characteristics. Finally, a LOGIT regression analysis model is constructed and run for each of the cohort files, to establish each variable category value's effect upon the probability for reenlistment. The results of analysis for each cohort year provide a mechanism for viewing the changing characteristics of cohort groups.

The thesis also contains a review of previous literature related to the subject of analyzing and/or predicting reenlistment. The results of the analysis performed in the present work are compared to the results of previous studies.



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## I. INTRODUCTION

In a modern fighting force, the level of technical expertise required to operate increasingly complex weapons systems is rising higher and higher. In non-combat operations, there is also a dramatic and continuing increase in the level of sophistication in, among other things, information systems and operating techniques.

All of these increases in demands on personnel extend into increased demands on training systems, which ultimately translates into higher training costs. A method of planning that promises long-term reduction in training costs and which has evolved over the past few decades is detailed analysis of retention of enlisted personnel after the expiration of their first contract.

By analyzing the characteristics of service members in the military and correlating these characteristics with data that records whether or not the enlistees extend beyond the initial contract requirement, it may be possible to identify key characteristics that can indicate a probability for reenlistment. Such information could prove very useful in planning recruitment strategies and objectives, and could, in the long term, be responsible for considerable cost reductions. By identifying probable candidates for retention beyond the initial contract requirements, the military could avoid the costs associated with recruiting and training additional personnel to replace personnel in whom considerable training investments have been made, but who decide to leave military service, thus depriving the military of a "pay-off" on the initial training investment.

The purpose of this study is to conduct an analysis of the Defense Manpower Data Center's (DMDC) 1979 and 1988 cohort files to attempt to answer the following questions:

- What are the background characteristics of the 1979 cohort group, and what is the effect of these characteristics on the probability of reenlistment after the initial four year term?
- What are the background characteristics of the 1988 cohort group, and what is the effect of these characteristics on the probability of reenlistment after the initial four year term?
- What has changed from the 1979 cohort to the 1988 cohort?

The scope of the study is restricted to active duty Navy enlisted personnel.

Because this study uses the objective data recorded in the DMDC cohort files, no survey has been conducted of active duty personnel, past or present. There is, therefore, no intention to provide conclusions about the intentions of service members to reenlist, or about enlistee's perceptions of military life.

Chapter II offers a review of literature dealing with the issue of predicting retention. Chapter III presents information concerning the data employed in this study, and describes the methodology employed to achieve results. Chapter IV contains the results of preliminary data analysis on the 1979 and 1988 DMDC cohort files. The results of LOGIT model analysis are presented in Chapter V. Chapter VI offers conclusions and recommendations.

## II. LITERATURE REVIEW

### A. BACKGROUND

The purpose of this chapter is to discuss previous studies that have dealt with the issues involved in predicting service member retention. Studies investigating this issue have differed in many ways. They employ regression analysis, path analysis, or simple listings and/or cross tabulations of factors thought to be important. These studies have used data from background information, surveys, or personal interviews. Some of the studies have focused on single issues, such as gender or race, while others have looked at a variety of issues to determine which among them is the most important.

While retention research has traditionally focused on pecuniary issues, the growing trend is to investigate the influence of a much broader range of employment satisfaction. This has led to an increasing reliance on techniques incorporated from such disciplines as sociology and psychology.<sup>1</sup> Many of the studies that have taken place regarding retention have portrayed the decision to remain in a job as one that weighs the relative costs and benefits associated with the job. In military service, the benefits associated with continued involvement include factors such as pecuniary compensation, fringe benefits, and training, which are also found in civilian employment, and additional intangible benefits such as status, camaraderie, and service to country.<sup>2</sup> Other studies on

---

<sup>1</sup> Doering, Z.D. and Grissmer, DW, *Active and Reserve Force Attrition and Retention: A Selected Review of Research and Methods*, The Rand Corporation, Report No. P-7007, Santa Monica, California, 1988.

<sup>2</sup> Hulin, C.L., Roznowski, M. and Hachiya, D., "Alternative Opportunities and Withdrawal Decisions: Empirical and Theoretical Discrepancies and an Integration", *Psychological Bulletin*, v. 97, No. 2, pp. 233-250, 1985.

retention have used a simpler model, saying that the choice as to whether or not to continue working in a job is based upon two factors: the availability of other jobs and the level of happiness connected with the current job.<sup>3</sup>

Statistical measurements of individuals' satisfaction with their jobs is accomplished using surveys. In these surveys, questions are asked regarding different aspects of a person's job. The responses are correlated and significant factors are identified based upon similar responses.<sup>4</sup> The most widely accepted view of job satisfaction assumes that each person has some standard of what is to be expected from a particular job. Individuals compare that standard with their own perception of how closely the job meets that standard, and the degree of job satisfaction results from the difference between the individual's standard or expectations and what is actually received from the job.<sup>5</sup> There is a split among researchers as to whether the standard developed by the individual comes from personal needs or personal values.<sup>6</sup>

The reliability of surveys conducted immediately prior to the reenlistment decision was evaluated by Hiller.<sup>7</sup> He found that the data collected from surveys, which characterizes the intentions of the service member, appears to be closely and

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<sup>3</sup>Lacy, James L., *Naval Reserve Forces: The Historical Experience with Involuntary Recalls*, Center for Naval Analyses, Report No. CRM 86-76, Arlington, Virginia, April 1986.

<sup>4</sup>Muchinsky, Paul M., *Psychology Applied to Work: An Introduction to Industrial and Organizational Psychology*, The Dorsey Press, Chicago, Illinois, 1983.

<sup>5</sup>Ibid. p. 399.

<sup>6</sup>Theilmann, Robert J., "An Analysis of the Factors Affecting Marine Corps Officer Retention", Master's Thesis, Naval Postgraduate School, Monterey, CA , 1990, p. 11.

<sup>7</sup>Goldberg, L., *Enlisted Supply: Past, Present, and Future*, Center for Naval Analysis, Washington, DC, September, 1982.

systematically related to actual reenlistment behavior, and may be used in the analysis of reenlistment factors. This conclusion was reinforced by the findings of Doering and Grissmer, who concluded that the most effective approach to determine what causes people to reenlist or to leave the service is to survey individuals about their intentions at various times before their actual decision.<sup>8</sup>

## B. THE STUDIES

In a review of over 120 previous studies, Cotton and Tuttle summarized the results.<sup>9</sup> Many of the studies had come to entirely opposite conclusions about the various causes of turnover and their relative importance in the decision to leave a job. The many factors that influence such a decision were grouped into three categories: external factors, work-related factors, and personal characteristics. The authors found that, in the main, the factors of age, pay, tenure, overall job satisfaction, employment perceptions, education and demographic status were stable, reliable correlates with turnover. Task repetitiveness, accession rate, and intelligence were found to be only weakly related to turnover. The unemployment rate, job performance, role clarity, satisfaction with coworkers and promotional opportunities, marital status and aptitude were found to be moderately related to turnover. Cotton and Tuttle further asserted that, though not a reliable indicator of turnover at the individual level, national economic data provided an indication of turnover at the aggregate level. Also, though few studies examined such

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<sup>8</sup>Doering and Grissmer, p. 32.

<sup>9</sup>Cotton and Tuttle, "Employee Turnover: A Meta-Analysis and Review with Implications for Research", *Academy of Management Review*, Vol. 11, No. 1, pp. 55-70, 1986.

issues at the time, they maintained that met expectations, behavioral intentions, and organizational commitment were reliable predictors of turnover.

Grissmer and Kirby conducted a study of retention in the US Army Reserve and National Guard.<sup>10</sup> While the present study is strictly concerned with active duty personnel, there are several findings of Grissmer and Kirby worth mentioning here. For instance, the study concluded that pay grade of E5 or higher, prior enlistment experience, being a female, being black, and being older all had a significant positive effect on the likelihood of retention. Having pay grade E3 or below, being in a combat job, having higher years of service, higher civilian hourly wages, and availability of paid overtime all had a significant negative effect on the probability of retention.

A study of reenlistment behavior utilizing survey data was performed by Hand, Griffeth, and Mobley.<sup>11</sup> They determined that training opportunities, travel opportunities, advancement opportunities, pay, benefits, and job security all had a significant positive effect on a service member's intention to remain in the service. Significant negative influences on the decision were determined to be the probability of separation from family members, long work hours, and poor leadership.

In an attempt to quantify the impact of the offering of reenlistment bonuses, Lakhani and Gilroy constructed a LOGIT regression model using data from the 1981

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<sup>10</sup> Grissmer and Kirby, *Attrition and Retention in the Army Reserve and Army National Guard: An Empirical Analysis*, Report No. R-7077, Rand Corporation, Santa Monica, California, 1985.

<sup>11</sup> Kraut, A.J., "Predicting Turnover of Employees from Measured Job Attitudes", *Organizational Behavior and Human Performance*, pp. 233-243, Vol. 13, 1975.

National Longitudinal Survey.<sup>12</sup> The model included variables designed to represent both economic and non-economic factors. Economic factors included reenlistment bonuses, the ratio of civilian to military pay, and the unemployment rate; non-economic factors included AFQT scores, race, and number of dependents. The analysis concluded that both reenlistment bonuses and civilian to military pay ratios were positive and significant for virtually all occupational categories. Though bonuses might well be expected to enhance retention probability, the results regarding civilian pay ratios were surprising. The calculation of military pay, however, included allowances for housing, food, and benefits, which significantly affected the resulting ratios.

Goldberg conducted a 1985 CNA study which also examined the issues of employment and military pay (including bonuses).<sup>13</sup> The study concluded that, though unemployment is an important determinant of retention, it is of secondary importance to the influence of military pay. Goldberg observed that flexible, targeted pay, such as enlistment and reenlistment bonuses, are the Navy's most potent tool for controlling retention rates.

Siggerud conducted a study of social, environmental, and economic factors influencing an enlisted member's decision of whether to leave or remain in the service and reported the results in 1981.<sup>14</sup> The source of data for the research was the 1978

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<sup>12</sup>Hosek, J.R., and Peterson, C.E., *Reenlistment Bonuses and Retention Behavior*, Rand Corporation Report R-3199/1-MIL, May, 1985.

<sup>13</sup>Goldberg.

<sup>14</sup>Siggerud, Dan-Norman, *Retention Intention Among US Navy's Enlisted Personnel: An Analysis of Social, Environmental, and Economical Factors*, Master's Thesis, Naval Postgraduate School, Monterey, CA , October, 1982.

Department of Defense Survey of Officer and Enlisted Personnel. The results of the study concluded that the most important factors influencing the service member's decision to reenlist were military versus civilian pay opportunities, duty station, and family considerations. Contrary to the previously reported results, Siggerud suggested eliminating successive reenlistment contracts (and the associated reenlistment bonuses) after the first four years of service. He further suggested that the savings obtained from canceling the reenlistment bonus program could be used to restructure the military pay scale.

Siggerud's suggestion falls somewhat flat when reviewing the results found by Cymrot, who maintains that reenlistment rates increase in direct correlation to reenlistment bonuses offered.<sup>15</sup> This contention is reinforced in a study of the Navy's compensation system that was conducted by Warner and Goldberg. They also maintain that increases in reenlistment bonuses lead directly to corresponding increases in reenlistment rates.<sup>16</sup> Further findings of the Warner and Goldberg study indicate that sea duty has a significant negative impact upon the reenlistment rate associated with any given level of pay, and that married individuals are more likely to reenlist than unmarried individuals. The authors reported the hypothesis that health care benefits associated with military service are much more important to married enlistees than non-married enlistees.

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<sup>15</sup>Cymrot, Donald, *Defining the Population Making Reenlistment Decisions*, Center for Naval Analysis, CRM 85-51.

<sup>16</sup>Warner, John T., and Goldberg, Mathew S., *Determinants of Navy Reenlistment and Extension Rates*, Center for Naval Analysis, CNS 1168, Vol. 1., December, 1982.

Several studies have focused specifically on pecuniary benefits as a determinant of reenlistment. A specific method, the Annualized Cost of Leaving (ACOL) approach, was developed by Warner. It is widely used in the military to predict active duty retention.<sup>17</sup> This model is driven by military to civilian compensation ratios for the present and future, and affords a method of measuring the economic benefit of remaining in the service, as opposed to seeking civilian employment. The model is set up to produce an annual cost estimate that reflects the amount of money that will be lost by the enlistee if he or she leaves the service. It is assumed that the enlistee will compare this figure to the dollar value of his or her assumed preference for civilian life. A main feature of the ACOL approach is that it provides a way for the future benefit of retirement to be included in the determination. Some key problems in determining the overall impact of pecuniary benefits on retention follow.

For one, the complexity of the military compensation system (including housing, food, medical and dental care, clothing, etc.) includes many fringe benefits that are difficult to value. Even when detailed measures of what is known as real military compensation (RMC) are developed, this actual value (designed to include the various benefits associated with military service) may differ significantly from the value that is *perceived* by the service member. Chow and Polich developed a survey question to gauge this perception.<sup>18</sup> The results of their study demonstrated a significant variance

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<sup>17</sup>Quester, A.O., and Thomason, J.S., "Keeping the Force: Retaining Military Careerists", *Armed Forces and Society*, v. 11, No. 1, pp. 85-95, 1984.

<sup>18</sup>Chow, W., and Polich, J., *Models for the First-Term Reenlistment Decision*, The Rand Corporation, Report No. R-2468-MRAL, Santa Monica, California, 1983..

between the calculated RMC and the service member's perception of the value of military service. Additionally, income differentials between individuals in the same general occupation may often be accounted for by such variables as additional skills and performance. Yet another difficulty arises from the fact that the impact of enlistment bonuses is problematic as a measure of reenlistment probability because the bonus is awarded after the decision to reenlist, and the decision to reenlist may have been made upon a pecuniary basis prior to considering the bonus.<sup>19</sup>

Warner and Simon examined the influence of pay at two points in the service member's career: the first reenlistment point and the second reenlistment point.<sup>20</sup> The significant positive influence of reenlistment bonuses at the first reenlistment point was confirmed by this study. However, the authors reported an interesting phenomenon. In the cases where high levels of reenlistment bonuses exist at the first reenlistment point, enlistees who remain in the service and accept the bonus are less likely to reenlist at the second reenlistment point. The authors noted that the second reenlistment point, in these categories of occupations, carried a significantly smaller bonus for reenlistment, and that the negative influence on reenlistment probably came about due to the service member's higher expectations and the fact that the desire for civilian life at the second reenlistment point probably exceeded the enlistee's perceived financial benefit from staying. An interesting item to note here is the common view that perceived future benefits of

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<sup>19</sup>Warner, J.T., *Issues in Navy Manpower Research and Policy: An Economist's Perspective*, Center for Naval Analysis, Professional Paper 322, Alexandria, Virginia, 1981.

<sup>20</sup>Warner, J.T., and Simon, B., *An Empirical Analysis fo Pay and Navy Enlisted Retention in the AFV: Preliminary Results*, Center for Naval Analysis, Alexandria, Virginia, 1979.

retirement are held to a significant influence on the reenlistment decision as of the seventh year of service, which is within the time frame examined as the second reenlistment point.<sup>21</sup>

In another extension of the research on pecuniary effects, Enns, examined first term reenlistment bonuses.<sup>22</sup> Using Army enlistees as his focus, he reported results similar to those discussed above: namely, a significant positive effect for reenlistment bonuses on reenlistment after the first four years of service. He went on to examine lump sum versus installment bonuses, and found that the former had a significantly greater positive effect on reenlistment.

In 1989, Lempe conducted a multivariate analysis of first and second term reenlistment using data from the 1985 Department of Defense Survey of Officer and Enlisted Personnel.<sup>23</sup> His results confirmed those reported by Warner and Simon: higher first term bonuses are often responsible for decreased second term retention (retention beyond the second reenlistment point). He also reported that those in higher mental categories (determined by AFQT scores) were less likely to reenlist at the first and second reenlistment points than those in lower mental categories, and that those with higher

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<sup>21</sup>Boesel, D., and Johnson, K., *Why Service Members Leave the Military: Review of the Literature and Analysis*, Defense Manpower Data Center, Personnel Survey Branch, Arlington, Virginia, April, 1984.

<sup>22</sup>Enns, John H., *Reenlistment Bonuses and First-Term Retention*, The Rand Corporation, Santa Monica, California, 1977.

<sup>23</sup>Lempe, S.J., "A Multivariate Analysis of the Factors Affecting the Retention of First and Second Term Air Force Enlisted Members", Master's Thesis, Naval Postgraduate School, Monterey, California, December, 1989.

levels of education were more likely to leave the service. Those aggregate groups found to be more likely to reenlist included minorities, older personnel, and males.

Doering and Grissmer pointed out the importance of non-pecuniary factors such as training opportunities, health care, job satisfaction, educational benefits, relocations, family separations, work schedules, and other "quality-of-life" variables.<sup>24</sup> They suggested that the military examine closely the cost-effective potential of non-pecuniary benefits in preparing compensation packages for enlistees, that non-pecuniary benefits relating to education were of particular importance in retaining high-quality personnel, and that an effort should be made to preserve qualities such as institutional loyalty and cohesion as incentives to remain in the service.

A paradox was offered in the results of research conducted by Finn.<sup>25</sup> His study of fiscal 1988 Air Force entrance surveys indicated the 78% of those who enlisted in the Air Force did so for training, and that 92% listed training among the top three reasons for enlisting. The results of his analysis, however, showed that the individuals who enlisted for a specific kind of training chose to apply the benefit of that training to the civilian sector at the earliest possible opportunity. In other words, a significant number of enlistees in his study received specialized training in the first four years of service and chose not to reenlist so that they could apply that training in the search for a civilian job.

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<sup>24</sup>Doering and Grissmer, p. 15.

<sup>25</sup>Finn, Thomas A., "Retention Behavior of First and Second Term Marine Enlisted Personnel, Master's Thesis, Naval Postgraduate School, Monterey, California, December, 1988.

## C. SUMMARY

The studies discussed in this chapter represent only a small fraction of those that have been conducted in the area of analyzing and/or predicting retention rates and the influencing factors behind them. The reader is referred to the bibliography, which includes several studies not specifically mentioned above. Though by no means exhaustive, the review of studies in this chapter enables several general conclusions to be made which are relative to the aim of this study.

First, the generally accepted view is that higher levels of education and/or higher AFQT test scores have a significant negative effect on reenlistment. This is a recurring theme in both studies that draw conclusions based upon objective data that from personnel records and subjective data from surveys.

Second, married service members, and service members with dependent children, are more likely to reenlist than single members. This is ostensibly due to the real and perceived value of such non-pecuniary benefits as health care and housing.

Third, males are more likely to reenlist than females. This conclusion is probably the most contested in the results of the studies reviewed, however. One or two surveys claim no significant difference in reenlistment based upon gender; while a majority of studies claim higher male reenlistment. However, there are those researchers who claim that *female reenlistment* is slightly higher than male reenlistment, because there is less discrimination in the military than in the civilian workplace.<sup>26</sup>

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<sup>26</sup> See specifically Warner and Goldberg, p. 30.

Fourth, minorities are more likely to reenlist than white service members. The reason that is commonly given for this phenomenon is the same as that applied to females, above. The majority of researchers report that minorities have opportunities in military service that are not available to them in civilian life.

### III. DATA AND METHODOLOGY

#### A. DATA

This thesis employs data found in the Defense Manpower Data Center's (DMDC) 1979 and 1988 cohort files. A cohort is composed of all of the personnel who entered the service in a given year. Each of the cohort files is composed of records containing a total of 365 variable fields. Each field conveys specific information about the characteristics of an enlistee. All Naval enlistees for the subject years are represented in the cohort files.

The 1979 cohort file consists of a total of 84,334 records. The cohort file for 1988 includes a total of 93,338 records. Appendix A contains descriptions of each of the record fields found in the cohort files.

#### B. PRELIMINARY ANALYSIS

##### 1. Initial Variables

The first step undertaken in the preliminary analysis was to identify which of the fields in the cohort data files contain information that would be useful in achieving the objectives of this study. From the total number of fields in the cohort file, the following were chosen:

- *CDISTRICT* -- indicating the census district in which the enlistee enlisted
- *ENTRYAGE* -- indicating the age at which the enlistee enlisted
- *HIYREDUC* -- indicating the enlistees highest year of education
- *SEX* -- indicating the gender of the enlistee
- *RACE* -- indicating whether the enlistee is white, black, or other minority
- *MARST\_DP* -- indicating whether the enlistee is married and the number of dependents
- *AFQTGRPS* -- indicating the score grouping into which the enlistee's Armed Forces Qualification Test (AFQT) score falls
- *ACCESSVC* -- indicating which branch of service the enlistee is entering
- *PRIORSVC* -- indicating whether the enlistee has prior service experience

- *ENTRSTAT* -- indicating what the entry status of the enlistee is (direct to active duty, from DEP, CACHE, etc., into DEP, from reserves)
- *ENLTERM* -- indicating the enlistee's initial term of service
- *ENLOPT* -- indicating which enlistment options were taken by the enlistee

## **2. Frequency**

To obtain an initial perspective on the cohort data files, a frequency report was generated using the SAS statistical program. Using this report, it was possible to examine the make-up of the 1979 and 1988 cohort. This initial examination brought out several issues to be addressed before analysis could continue, such as: inconsistencies in the dataset, extremely odd occurrences of data (such as 71-year-old enlistees), and the presence of records that were not useful in the current study (such as enlistees in the naval reserves).

## **3. Limitation/Restriction of Dataset**

The next step in the preliminary analysis was to limit or restrict the dataset. The purpose behind this step was to eliminate records containing some of the flaws enumerated in the previous section so that those records would not unduly influence the probabilities to be generated using multivariate regression analysis technique.

The following actions were taken to limit the dataset:

- Only records indicating enlistment within the actual fiscal year were allowed.
- Only records indicating an AFQT score greater than zero were allowed.
- Only records indicating an enlistment option greater than zero were allowed.
- Only records with entry ages between 17 and 31 were allowed.
- Only records with entry level pay grades between E1 and E6 were allowed.
- Only records indicating entry into active duty Navy were allowed.
- Only records indicating an enlistee with an initial enlistment term of four years were allowed.

Of all of the restrictions mentioned above, all but one were achieved by eliminating undesirable records through checking a specific value in a variable field. For the enlistment term, the cohort data file was cross referenced with the master loss file, and only records in which the entry date subtracted from the separation date indicated a term of 49 months or more were allowed.

#### **4. Cross-Tabulation**

Once the dataset had been restricted, cross-tabulations were performed between the various values present in each data field (variable) and the corresponding rate of reenlistment. Those were performed for both the 1979 and 1988 cohort datasets. The purpose of making these cross-tabulations was to indicate which values were coincident with high (or low) reenlistment rates. This information is useful for two reasons: first, it provides an initial indication and allows for comparison with the resulting LOGIT model probabilities, and; second, it may reveal tendencies in the dataset that will prove useful in LOGIT model variable definition and model construction.

To determine whether or not an individual had served longer than the initial four-year commitment, information beyond that contained in the cohort data files was needed. DMDC, which maintains the cohort files, also maintains the "Master Loss File" for each and every cohort file. This file contains a variety of information about enlistees in the cohort, including their separation date and their total length of service (recorded in months). For the purposes of this study, an individual with a term of service greater than

forty-nine months was considered to have either reenlisted or extended their original enlistment beyond an initial four-year commitment. Hereafter, the term "reenlistment" is held to include both reenlistment and extension of enlistment, and should be considered to be reflective of actual retention.

### **C. MULTIVARIATE REGRESSION ANALYSIS**

Multivariate regression analysis is a statistical method commonly used to explain the effect of a series of known factors upon another single factor. The series of factors expected to have influence the single factor are expressed as independent variables; and the single factor upon which these independent variables exert an influence is expressed as the dependent variable. Regression analysis determines whether or not a significant relationship exists between a given independent variable and the dependent variable, and quantifies the effect.<sup>27</sup> In this manner, it is possible to evaluate the significance of an independent variable with regard to its effect on the dependent variable. Three different multivariate analysis models were examined for use in this thesis. The following section provides a brief description of each.

#### **1. Choice of Method**

The three models investigated for use in this thesis were the Linear Probability Model, the PROBIT Model, and the LOGIT Model. The first of these models is suited to situations in which the dependent variable is a linear function of the independent variables, which is not appropriate to the objective of the current inquiry. Additionally,

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<sup>27</sup> Studenmund, 1987.

the linear probability model is known to have weaknesses in the areas of estimation and prediction. Heteroscedasticity, an effect whereby the variance of the error terms is not constant for all observations, is a noted problem which results in inefficient estimations. In addition, attempting to limit the predicted values of probability to the binary range (0,1) can produce estimates based upon biased input.<sup>28</sup>

The PROBIT model, by contrast, employs a nonlinear specification based upon an S-shaped curve that is bounded by the interval 0,1, and provides good estimates of probability of influence on binary dependent variables. This model is complicated, however, and comparable results can be achieved by the third model considered.

The third model to be examined, the LOGIT model, uses a non-linear specification similar to that of the PROBIT model. This model also offers the ability to calculate changes in the probability of the effect on the dependent variable. An additional advantage of the LOGIT model is that it minimizes the effects of heteroscedasticity.<sup>29</sup> All of these benefits can be obtained using the LOGIT model, which is comparatively easy to use and interpret.

## 2. LOGIT Model Specifications

As noted above, one requirement for employing of the LOGIT model is that the dependent variable describes a binary event. This is appropriate to the task at hand, as the dependent variable used in the present work describes whether or not an enlistee

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<sup>28</sup> Kmenta, 1986, pp. 553-555.

<sup>29</sup> Kmenta, 1986 pp. 550-553.

remained in the service (reenlisted or extended) beyond his or her initial four-year commitment.

The LOGIT model is based upon the cumulative distribution function of a random variable, which suits it to situations in which the independent variable(s) are dichotomous (i.e., having a value of 0 or 1).<sup>30</sup> The decision to leave the service is a dichotomous variable which assumes a value of zero if an enlistee does not extend or reenlist beyond the initial commitment of four years, and assumes a value of one if the separation date indicates that the individual remained in the service beyond that initial commitment.

The LOGIT model relates the reenlist or extension status of an individual ( $Y_i$ ) to a vector of characteristics for that individual ( $X_i$ ). The assumed relationship is:

$$P_i = E(Y = 1 | X_i) = \frac{1}{1 + e^{-(B_0 + B_1 X_{i1} + \dots + B_k X_{ik})}}$$

where  $e$  is the base of the natural logarithm;  $P$  is the probability that an individual reenlists, given the personal attributes  $X_1, X_2, X_3, \dots$ ;  $X$  represents data base values for each of the explanatory variables in the model;  $B$  represents values of the estimated parameters provided by the LOGIT model, and;  $k$  is the number of explanatory variables in the model. The above can be more easily written as

$$P_i = \frac{1}{1 + e^{-z_i}}$$

where  $z_i = B_0 + B_1 X_{i1} + \dots + B_k X_{ik}$ .

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<sup>30</sup> Lakhani, H. and Gilroy, C., "Army Reenlistment and Extension Decisions by Occupation", *Army Manpower Economics*, Westview Press, pp. 225-256, 1984.

LOGIT analysis in this study was accomplished using an IBM 370 Model 3033 computer located at the Naval Postgraduate School in Monterey, California. The software used was the LOGIT procedure in the Statistical Analysis Software (SAS) statistical programming package.



## IV. PRELIMINARY ANALYSIS

The objective of this chapter is to present the results of preliminary data analysis performed on the DMDC 1979 and 1988 cohort files. The first section of the chapter discusses the 1979 cohort, presenting results of frequency and cross-tabulation analysis performed on the limited dataset (see Chapter III, Section B, Subsection 3). The second section offers the same analyses for the 1988 cohort file. The third section provides the reader with graphical depictions of the changes observed in frequency and cross-tabulation between 1979 and 1988.

### A. 1979 COHORT

#### 1. Frequency

In examining the frequency of variable values for each field in the DMDC 1979 cohort records, the total number of responses for a given variable is divided by the total number of records, yielding a percentage. This yield is the percentage of total enlistees who are described by the given variable. Results are graphically depicted in the figures below, while a summary table listing all values obtained may be found at the end of the section.

Figure 1 presents the frequency analysis for the Census District field. The South Census District is the largest single source for enlistees (35%), followed by the North Central District (24.3%), the North East District (22.4%), and the West District (17.2%). "Other" areas account for a relatively low percentage (1.1%) of enlistees.

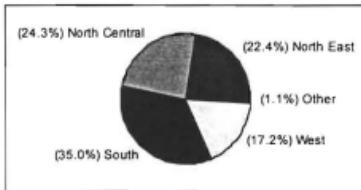


Figure 1. 1979 Cohort Frequency by Census District.

Figure 2 depicts the 1979 cohort group by age. The largest single age group is 18 year olds. As age increases beyond 18, there is a noticeable downward slope to percentages registered by each successive age.

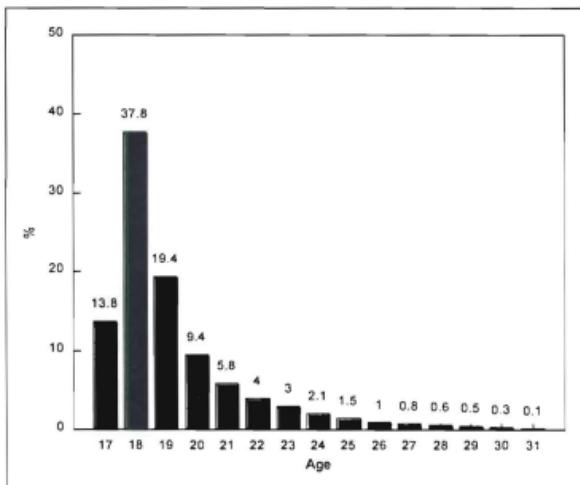


Figure 2. 1979 Cohort Frequency by Enlistment Age.

Figure 3 illustrates the educational backgrounds of the 1979 enlistees. The largest percentage is clearly made up of enlistees with high school diplomas.

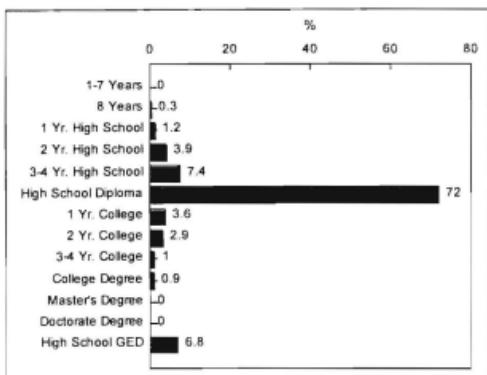


Figure 3. 1979 Cohort Frequency by Highest Year of Education.

Figure 4 shows the frequency of male and female enlistees in the cohort group. As noted in the figure, males comprise 87.6% of the cohort group, while females account for only 12.4% of the total.

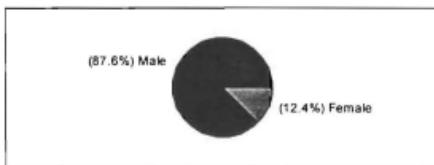


Figure 4. 1979 Cohort Frequency by Gender.

Figure 5 illustrates the racial make-up of the 1979 cohort. Whites account for 84.2% of the enlistees, while blacks and other minorities are 13.6% and 2.2%, respectively, of the entire cohort group.

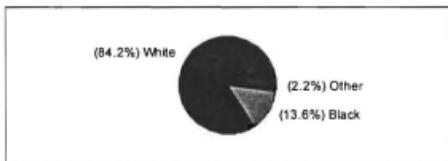


Figure 5. 1979 Cohort Frequency by Race.

Figure 6 presents the marital/dependent status of the cohort group. Single enlistedees with no dependents are by far the majority of the cohort (94.6%). Married enlistedees with no dependents (3.2%), married enlistedees with one dependent (0.9%), and married enlistedees with two dependents (0.7%) are the only other significant variable groups in the sample.

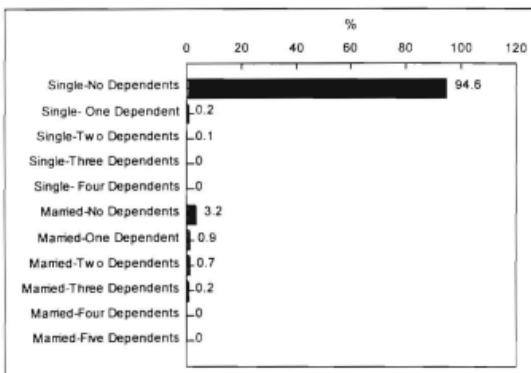


Figure 6. 1979 Cohort Frequency by Marital/Dependent Status.

Figure 7 illustrates the AFQT performance of the enlistees described in the cohort file. Enlistees with scores in the second highest grouping (65-92%) account for the largest single variable group (32.1%), followed by those scoring in the 31-49% range (25.5%), those scoring from 50-64% (18%), those scoring from 21-30% (11.5%), and those in the ranges 93-99%, 16-20%, and 10-15% (7.7, 3.2, and 1.9% of the total sample, respectively). Enlistees scoring below 10% did not register as a significant percentage of the sample.

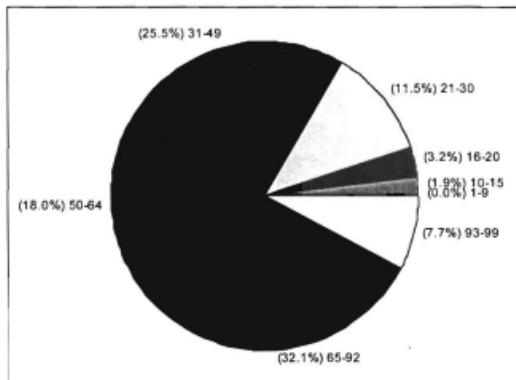


Figure 7. 1979 Cohort Frequency by AFQT Group.

Figure 8 describes the 1979 cohort by the enlistees' prior service backgrounds. Of the total sample, the vast majority (96.6%) had no prior service background. A very small percentage (0.7%) of enlistees had an prior Army service background.

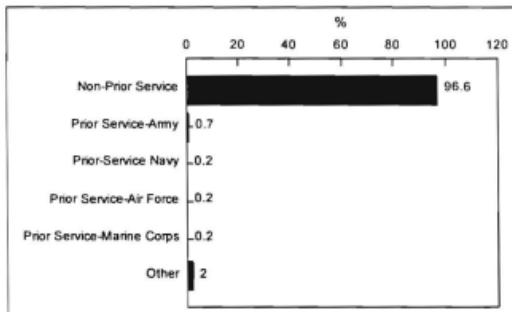


Figure 8. 1979 Cohort Frequency by Prior Service Experience.

The entry status of the 1979 cohort is illustrated in Figure 9. A high percentage (83.9%) of enlistees in the cohort entered active duty from the DEP, CACHE, or a similar program. A significant minority (16%) of enlistees made the transition directly to active duty, while a very small number (0.1%) entered active duty from the reserves.

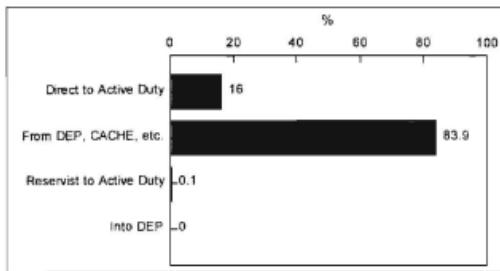


Figure 9. 1979 Cohort Frequency by Entry Status.

Figure 10 presents the 1979 cohort by the enlistees' entry level pay grade. While the majority of the sample records (62.5%) indicate entry at the E-1 level, a substantial number of enlistees (31.2%) were inducted at the E-3 level. A smaller number (6%) entered the service at the E-2 pay grade.

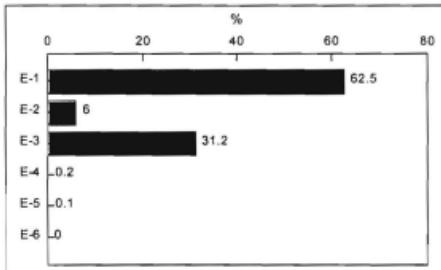


Figure 10. 1979 Cohort Frequency by Entry Pay Grade.

Figure 11 presents the frequency of various enlistment options in the dataset. As has been noted previously, the large number of records with “other” enlistment options makes it difficult to interpret the impact of the defined variables. However, there are a large number (19.2%) of enlistees with a guaranteed advanced enlistment grade, a somewhat smaller number (11.2%) of enlistees with accelerated promotion and guaranteed training or skill options, and also enlistees with advanced enlistment grade (1.4%), guaranteed unit or geographic location (3%), and guaranteed training or skill plus the buddy program (2.3%). Various other combinations also account for a small percentage of total records.

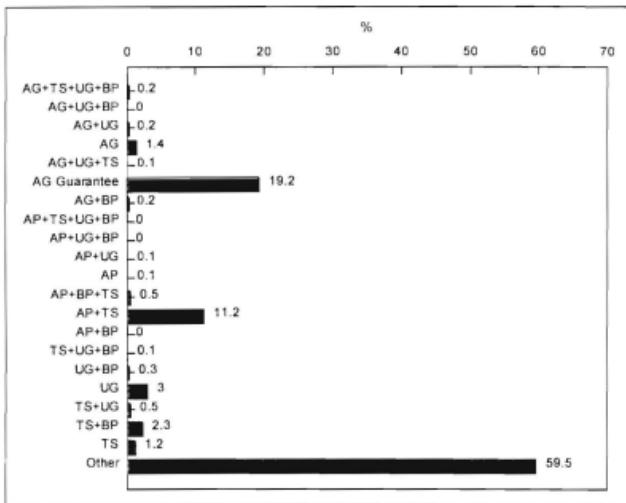


Figure 11. 1979 Cohort Frequency by Bonus Option.

## 2. Cross-Tabulation

The purpose of cross-tabulating the data from the cohort data files is to begin to form an idea about what kinds of variables are likely predictors of reenlistment behavior, and are therefore good candidates for inclusion in the LOGIT model. Each of the variable values for each dataset field was cross tabulated with the loss file (see Chapter III) to determine the co-incidence of the given variable and retention beyond the initial four years. Results are graphically depicted in the figures below, while a summary table listing all values obtained may be found at the end of the section.

Figure 12 illustrates the 1979 cohort reenlistment rate by Census District. While all of the variables have coincidence with an approximate percentage of reenlistment, "Other" (53.3%) clearly stands out, while "North Central" (44.76%) falls somewhat short of the others.

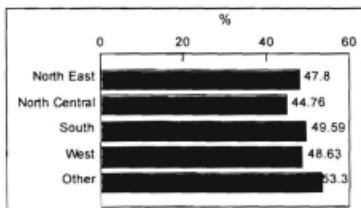


Figure 12. 1979 Cohort Reenlistment Rate by Census District.

Figure 13 presents the cross tabulation result for reenlistment rate by age. The general trend observed is that reenlistment rates increase with the age group of the enlistee. There are a few exceptions to the slope of increase, notably the 18, 25, and 27-year-old groups, which jump ahead in the rate of reenlistment.

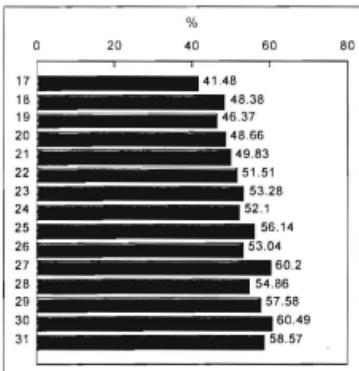


Figure 13. 1979 Cohort Reenlistment Rate by Age.

Figure 14 illustrates reenlistment rates according to highest level of education achieved by the enlistee. The group with the highest rate of reenlistment (62.53%) is made up of those enlistees who possess a college degree. The lowest reenlistment rate (24.87%) is for individuals who have only one year of high school education.

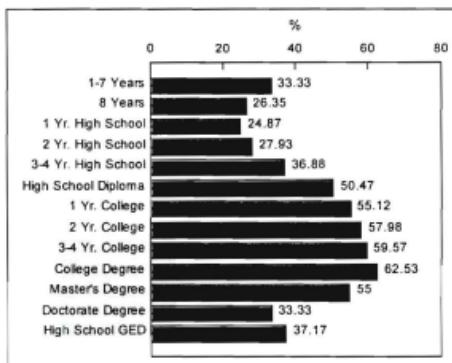


Figure 14. 1979 Cohort Reenlistment Rate by Highest Year of Education.

Figure 15 illustrates the rate of reenlistment by gender. While males (48.23%) have a higher reenlistment rate than females (45.46%). The difference is rather small.

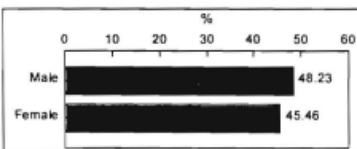


Figure 15. 1979 Cohort Reenlistment Rate by Gender.

In Figure 16, the rate of reenlistment is broken down by marital/dependent status. The graph indicates that single enlistees who have dependents have a higher rate of reenlistment than those who are single, and that married enlistees are generally more likely to reenlist than single enlistees.

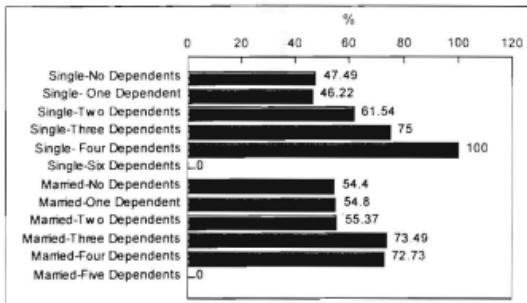


Figure 16. 1979 Cohort Reenlistment Rate by Marital/Dependent Status.

Figure 17 presents the results of cross tabulation for reenlistment rate by AFQT score grouping. Though the slope of increase is by no means smooth, the graph generally indicates that personnel with higher scores are more likely to reenlist.

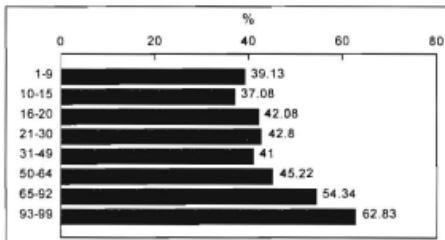


Figure 17. 1979 Cohort Reenlistment Rate by AFQT Group.

Figure 18 shows the reenlistment rate for the 1979 cohort by prior service record. The reenlistment rates for those enlistees with prior service experience are higher than those of enlistees with no prior service experience.

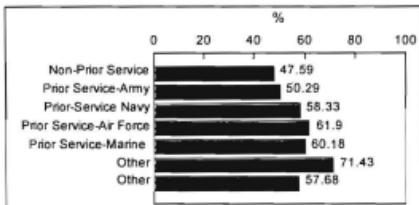


Figure 18. 1979 Cohort Reenlistment Rate by Prior Service Experience.

As shown in Figure 19, the reenlistment rate for enlistees who come to active duty from the reserves is fully 50%. Those enlistees who enter active duty from the DEP, CACHE, etc., have comparably high reenlistment rates.

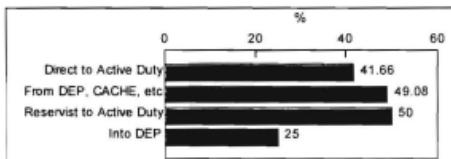


Figure 19. 1979 Cohort Reenlistment Rate by Entry Status.

Figure 20 illustrates the rate of reenlistment by entry level pay grade. The graph indicates that reenlistment rates increase with the pay grade awarded the enlistee upon enlistment. While the pay grades E5 and E6 are unlikely entry level pay grades, the jump in reenlistment rates for pay grades E3 and E4 is significant.

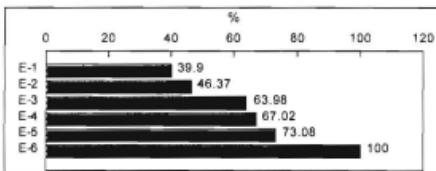


Figure 20. 1979 Cohort Reenlistment Rate by Entry Pay Grade.

Figure 21 illustrates the rate of reenlistment for the 1979 cohort group by the enlistment options indicated in the cohort file. Generally, those options involving advanced enlistment grades and/or accelerated promotion have higher reenlistment rates than the options involving guaranteed training or skill, guaranteed unit or geographic location, or the buddy program.

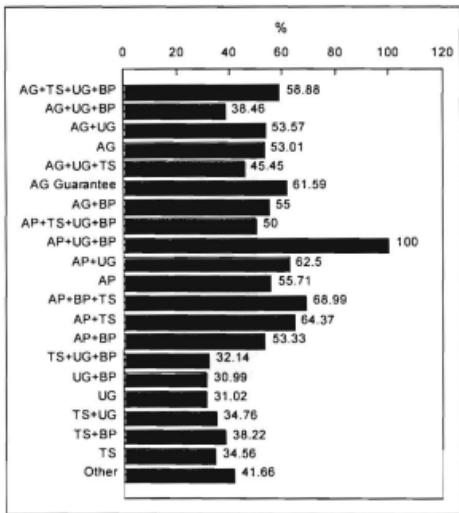


Figure 21. 1979 Cohort Reenlistment Rate by Enlistment Option.

TABLE 1. Summary of 1979 Cohort Variables and Reenlistment.

		Frequency	Not Retained	Retained
Census District of Origin	North East	11,147	5,819	5,328
	North Central	12,101	6,684	5,417
	South	17,436	8,790	8,646
	West	8,586	4,411	4,175
	Other	561	262	299
Age at Enlistment	17	6,873	4,022	2,851
	18	18,812	9,710	9,102
	19	9,653	5,177	4,476
	20	4,698	2,412	2,286
	21	2,868	1,439	1,429
	22	2,017	978	1,039
	23	1,477	690	787
	24	1,025	491	534
	25	757	332	425
	26	477	224	253
	27	392	156	236
	28	319	144	175
	29	231	98	133
	30	162	64	98
	31	70	29	41
Highest Year of Education	1-7 Years	12	8	4
	8 Years	148	109	39
	1 Yr. High School	595	447	148
	2 Yr. High School	1,930	1,391	539
	3-4 Yr. High School	3,677	2,321	1,356
	High School Diploma	35,885	17,773	18,112
	1 Yr. College	1,796	806	990
	2 Yr. College	1,428	600	828
	3-4 Yr. College	512	207	305
	College Degree	435	163	272
	Master's Degree	20	9	11
	Doctorate Degree	3	2	1
	High School GED	3,390	2,130	1,260
	Alternate Credentials	0	0	0

Gender	Male	43,674	22,608	21,066
	Female	6,157	3,358	2,799
Marital/Dependent Status	Single-No Dependents	47,157	24,764	22,393
	Single- One Dependent	119	64	55
	Single-Two Dependents	39	15	24
	Single-Three Dependents	4	1	3
	Single- Four Dependents	3	0	3
	Single-Six Dependents	0	0	0
	Married-No Dependents	1,592	726	866
	Married-One Dependent	458	207	251
	Married-Two Dependents	363	162	201
	Married-Three Dependents	83	22	61
AFQT Score	Married-Four Dependents	11	3	8
	Married-Five Dependents	2	2	0
	1-9	23	14	9
	10-15	933	587	346
	16-20	1,590	921	669
	21-30	5,743	3,285	2,458
	31-49	12,727	7,509	5,218
	50-64	8,978	4,918	4,060
Prior Service Record	65-92	16,011	7,310	8,701
	93-99	3,826	1,422	2,404
	Non-Prior Service	48,160	25,242	22,918
	Prior Service-Army	350	174	176
	Prior-Service Navy	120	50	70
	Prior Service-Air Force	105	40	65
	Prior Service-Marine Corps	113	45	68
Other		7	2	5
Other		976	413	563

Entry Status	Direct to Active Duty	7,984	4,658	3,326
	From DEP, CACHE, etc.	41,807	21,287	20,520
	Reservist to Active Duty	36	18	18
Pay Grade	Into DEP	4	3	1
	E-1	31,138	18,713	12,425
	E-2	3,002	1,610	1,392
Enlistment Options	E-3	15,542	5,598	9,944
	E-4	94	31	63
	E-5	52	14	38
Enlistment Options	E-6	3	0	3
	AG+TS+UG+BP	107	44	63
	AG+UG+BP	13	8	5
Enlistment Options	AG+UG	84	39	45
	AG	681	320	361
	AG+UG+TS	33	18	15
Enlistment Options	AG Guarantee	9,556	3,670	5,886
	AG+BP	80	36	44
	AP+TS+UG+BP	2	1	1
Enlistment Options	AP+UG+BP	2	0	2
	AP+UG	56	21	35
	AP	70	31	39
Enlistment Options	AP+BP+TS	258	80	178
	AP+TS	5,576	1,987	3,589
	AP+BP	15	7	8
Enlistment Options	TS+UG+BP	28	19	9
	UG+BP	171	118	53
	UG	1,496	1,032	464
Enlistment Options	TS+UG	233	152	81
	TS+BP	1,138	703	435
	TS	599	392	207
Enlistment Options	Other	29,633	17,288	12,345

## B. 1988 COHORT

### 1. Frequency

Figure 22 shows the geographical origins of the 1988 cohort by census district. The highest percentage of enlistees (37.9%) come from the South District, while the next highest percentage (26.1%) are from the North Central District. The West (19.9%) and North East (15.9%) Districts account for the remainder of the enlistment group, with the exception of a very small percentage (0.3%) that are recorded as "Other".

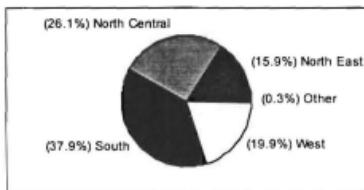


Figure 22. 1988 Cohort Frequency by Census District.

As shown in Figure 23, the largest single entry age group for the 1988 cohort is 18-year-olds (36.9%). As might be expected, due to the nature of military service, the percentage of enlistees in higher age groups gradually tapers off to a very small percentage (0.4%) at the age of 31.

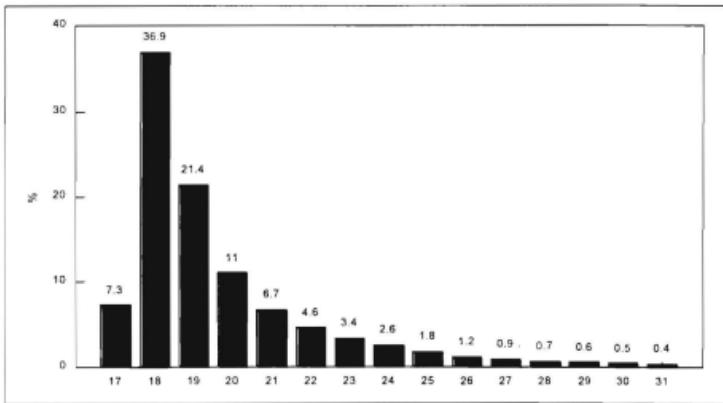


Figure 23. 1988 Cohort Frequency by Entry Age.

Figure 24 illustrates the make-up of the 1988 cohort by highest level of education achieved. The vast majority of enlistees in the cohort (88.5%) are high school graduates. A surprisingly high percentage (4.3%) of the records indicate possession of a doctorate. It is unclear whether or not this accurately represents the educational status of these individuals, or whether this statistic is the result of some error.

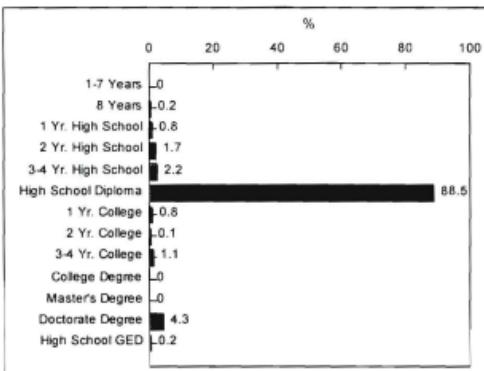


Figure 24. 1988 Cohort Frequency by Highest Year of Education.

As shown in Figure 25, the enlistees in the 1988 cohort are made up of primarily males (89.2%). Females (10.8%) account for a minority of the cohort group.

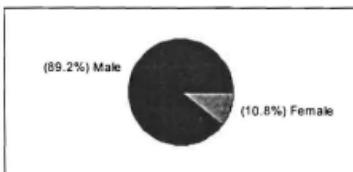


Figure 25. 1988 Cohort Frequency by Gender.

Figure 26 breaks down the 1988 cohort by race. Whites (79.3%) account for the majority, while blacks (17.3%) are a significant minority. Other races account for only 3.4% of the membership.

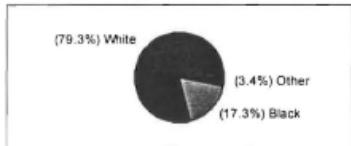


Figure 26. 1988 Cohort Frequency by Race.

The marital/dependent status of the 1988 cohort is illustrated in Figure 27. The vast majority of enlistees in this group are single, with no dependents (94.2%). The only other significant percentage in the group is that of enlistees who are single with four dependents (5.7%).

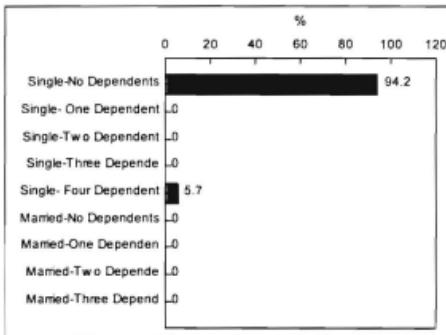


Figure 27. 1988 Cohort Frequency by Marital/Dependent Status.

Figure 28 presents the composition of the 1988 cohort by AFQT score grouping. The highest percentage of the cohort (38.7%) are in the score range of 65-92%, followed by the range 31-49% (26.4%), the range 50-64% (23.6), and smaller groups of 5.9% and 5.3% at the 21-30% and 93-99% ranges, respectively.

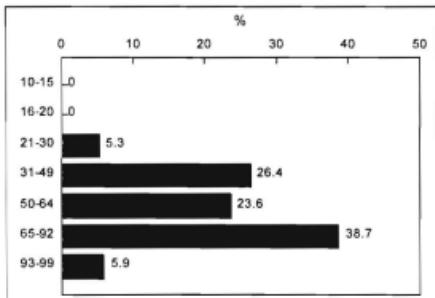


Figure 28. 1988 Cohort Frequency by AFQT Grouping.

As illustrated in Figure 29, almost all of the enlistees in the 1988 cohort have no prior service background.

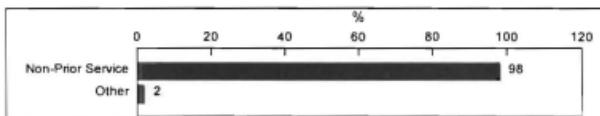


Figure 29. 1988 Cohort Frequency by Prior Service Experience.

Figure 30 shows the 1988 cohort by entry status. As indicated in the figure, almost all of the enlistees (99.1%) entered active duty from a program such as the DEP, CACHE, etc. A relatively small number (0.8%) entered active duty directly, while an even smaller number (0.2%) entered active duty from the reserves.

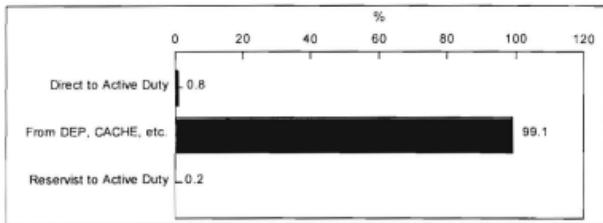


Figure 30. 1988 Cohort Frequency by Entry Status.

Figure 31 presents the composition of the 1988 cohort by entry pay grade. As evident in the figure, the majority (76.5%) of enlistees were awarded the pay grade E1 on enlistment. A significant percentage (16.9%) were awarded the pay grade of E3.

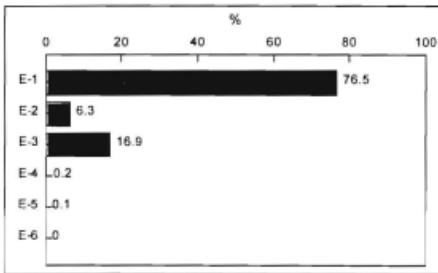


Figure 31. 1988 Cohort Frequency by Entry Pay Grade.

Figure 32 shows the makeup of the 1988 cohort group by recorded enlistment option. Seventy-two percent of the group membership are recorded as having "other" options, while a significant minority (16.7%) were guaranteed accelerated promotion and guaranteed training or skill.

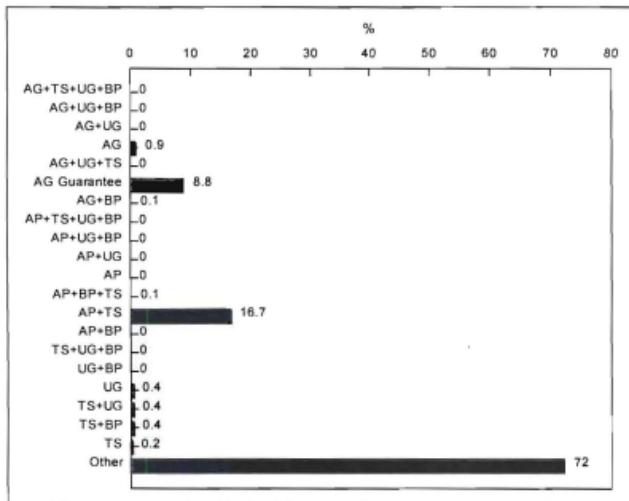


Figure 32. 1988 Cohort Frequency by Enlistment Option.

## 2. Cross-Tabulation

Figure 33 presents the results of cross tabulation for the 1988 cohort group by census district. The highest rate of reenlistment (58%) is noted for enlistees in the category "other", but it must be remembered that this category accounted for a very small percentage of the group. Of the remaining districts, "south" and "west" accounted for higher reenlistment rates (44.8% and 44.66%, respectively) than "north east" and "north central" (41.14% and 42.75%, respectively).

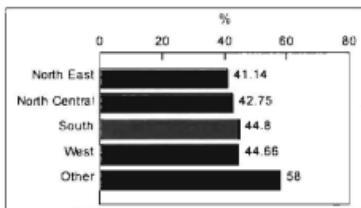


Figure 33. 1988 Cohort Reenlistment Rate by Census District.

Figure 34 presents the results of cross-tabulation for reenlistment rate by age group. Generally, the reenlistment rate increases with age.

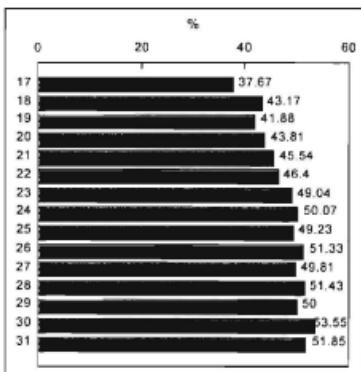


Figure 34. 1988 Cohort Reenlistment Rate by Entry Age.

Figure 35 shows the reenlistment rate for the 1988 cohort, broken down by highest year of education achieved. As shown in the figure, the rate of reenlistment increases with the level of education achieved by the enlistees. Note that the reenlistment

rate for enlistees with GEDs is generally higher than that for enlistees who have not graduated from high school nor received a GED.

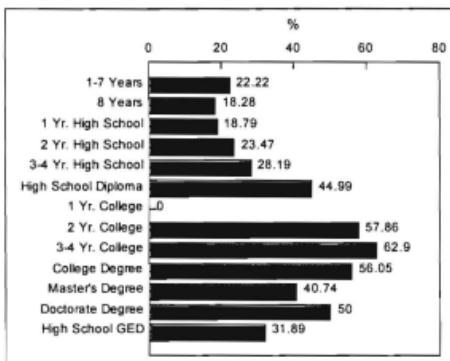


Figure 35. 1988 Cohort Reenlistment Rate by Highest Year of Education.

Figure 36 shows the reenlistment rate for the 1988 cohort by gender. Recalling that females accounted for a little more than ten percent of the cohort group, it is interesting to note that the two sexes are within one percentage point of each other in terms of the reenlistment rate.

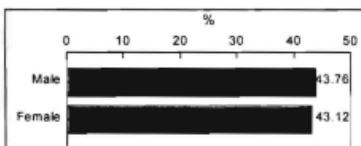


Figure 36. 1988 Cohort Reenlistment Rate by Gender.

Figure 37 presents the results of cross tabulation for the cohort by marital/dependent status. It appears that married enlistees (with or without dependents) are more likely to remain in the service than single enlistees.

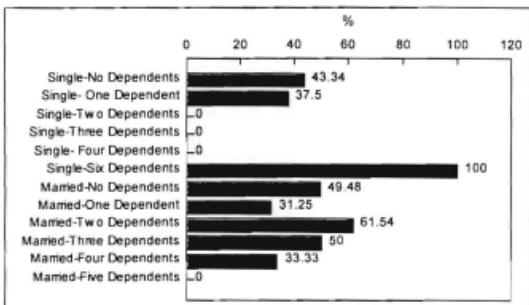


Figure 37. 1988 Cohort Reenlistment Rate by Marital/Dependent Status.

Figure 38 shows the reenlistment rate for the 1988 cohort by AFQT score group. Generally, higher scores mean higher reenlistment rates. The high rates in the 10-15% and 93-99% categories (50% and 60.67%, respectively), it should be remembered, are for relatively low percentages of enlistees (5.3% and 5.9% of the total group, respectively).

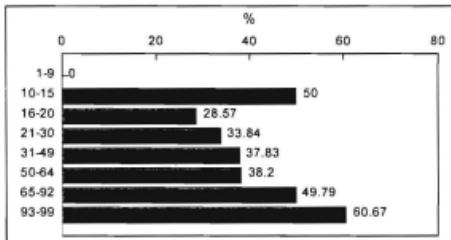


Figure 38. 1988 Cohort Reenlistment Rate by AFQT Group.

The 1988 cohort did not contain any members with prior service records other than the 2% who were in the second "other" category. Figure 39 indicates that 43.64% of the enlistees in the cohort with no prior service record (which is 98% of the total cohort) chose to reenlist.

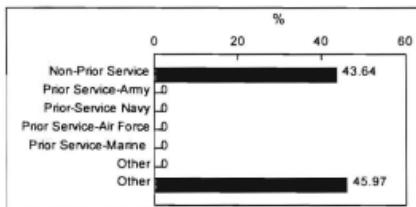


Figure 39. 1988 Cohort Reenlistment Rate by Prior Service Experience.

Figure 40 presents the reenlistment rate by entry status for the 1988 cohort. Recall that the vast majority of the enlistees (99%) entered active duty from a program such as DEP, CACHE, etc. This category of enlistee accounts for a slightly higher enlistment rate than the others (43.72%, as compared with slightly over 40% for each of the two other categories).

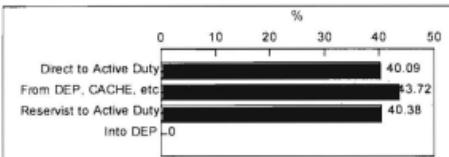


Figure 40. 1988 Cohort Reenlistment Rate by Entry Status.

Figure 41 indicates that the reenlistment rate in the 1988 cohort increases with higher entry level pay grades. The rate of 100% for E6 accounts for the nine individuals whose cohort file indicates an entry level pay grade of E6; all nine indicate continued enlistment after four years. Again, it is not clear whether these individuals were actually awarded this rank or the records contain errors.

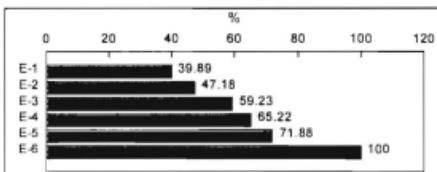


Figure 41. 1988 Cohort Reenlistment Rate by Entry Pay Grade.

The rates of reenlistment for the various categories of enlistment options for the 1988 cohort are illustrated in Figure 42. It must be remembered, however, that the only significant categories (determined by frequency) were "AG Guarantee", "AP+TS", and "Other". For these categories, the rates of reenlistment were 57.83%, 56.94%, and 38.98%. The last of these percentages was the rate for the highest number of enlistees (72%).

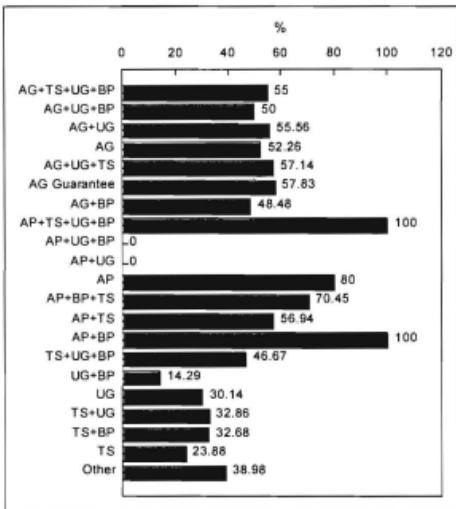


Figure 42. 1988 Cohort Reenlistment Rate by Enlistment Option.

Figure 42 is an excellent example of both the limitations of cross-tabulation, and the need for multivariate regression analysis. The various percentages listed in the figure might lead one to take action; such action would be unwarranted. Though it is true that fully fifty percent of the enlistees in the first category reenlisted, the significance of this statistic is reduced by the fact that there were only twenty individuals out of a total sample of 59,173 for whom the reenlistment rate is applicable. As noted in the figure on this variable field under "Frequency" above, this number did not even register a significant percentage.

TABLE 2. Summary of 1988 Cohort and Reenlistment.

		Frequency	Not Retained	Retained
Census District of Origin	North East	9,385	5,524	3,861
	North Central	15,447	8,843	6,604
	South	22,399	12,364	10,035
	West	11,792	6,526	5,266
	Other	150	63	87
Age at Enlistment	17	4,343	2,707	1,636
	18	21,860	12,424	9,436
	19	12,678	7,369	5,309
	20	6,482	3,642	2,840
	21	3,983	2,169	1,814
	22	2,707	1,451	1,256
	23	2,031	1,035	996
	24	1,536	767	769
	25	1,038	527	511
	26	713	347	366
	27	540	271	269
	28	420	204	216
	29	344	172	172
	30	282	131	151
	31	216	104	112
Highest Year of Education	1-7 Years	18	14	4
	8 Years	93	76	17
	1 Yr. High School	479	389	90
	2 Yr. High School	1,010	773	237
	3-4 Yr. High School	1,277	917	360
	High School Diploma	52,386	28,815	23,571
	1 Yr. College	0	0	0
	2 Yr. College	477	201	276
	3-4 Yr. College	62	23	39
	College Degree	678	298	380

	Master's Degree	27	16	11
	Doctorate Degree	6	3	3
	High School GED	2,537	1,728	809
	Alternate Credentials	123	67	56
Gender	Male	52,786	29,687	23,099
	Female	6,387	3,633	2,754
Marital/Dependent Status	Single-No Dependents	55,738	31,582	24,156
	Single- One Dependent	8	5	3
	Single-Two Dependents	1	1	0
	Single-Three Dependents	0	0	0
	Single- Four Dependents	0	0	0
	Single-Six Dependents	1	0	1
	Married-No Dependents	3,381	1,708	1,673
	Married-One Dependent	16	11	5
	Married-Two Dependents	13	5	8
	Married-Three Dependents	12	6	6
	Married-Four Dependents	3	2	1
	Married-Five Dependents	0	0	0
AFQT Score	1-9	0	0	0
	10-15	2	1	1
	16-20	7	5	2
	21-30	3,138	2,076	1,062
	31-49	15,648	9,728	5,920
	50-64	13,959	8,626	5,333
	65-92	22,908	11,503	11,405
	93-99	3,511	1,381	2,130

Prior Service Record	Non-Prior Service	57,983	32,677	25,306
	Prior Service-Army	0	0	0
	Prior-Service Navy	0	0	0
	Prior Service-Air Force	0	0	0
	Prior Service-Marine Corps	0	0	0
	Other	1,190	643	547
Entry Status	Direct to Active Duty	444	266	178
	From DEP, CACHE, etc.	58,625	32,992	25,633
	Reservist to Active Duty	104	62	42
	Into DEP	0	0	0
Enlistment Pay Grade	E-1	45,272	27,215	18,057
	E-2	3,743	1,977	1,766
	E-3	10,025	4,087	5,938
	E-4	92	32	60
	E-5	32	9	23
	E-6	9	0	9
Enlistment Options	AG+TS+UG +BP	20	9	11
	AG+UG+BP	2	1	1
	AG+UG	9	4	5
	AG	509	243	266
	AG+UG+TS	28	12	16
	AG Guarantee	5,217	2,200	3,017
	AG+BP	33	17	16
	AP+TS+UG +BP	1	0	1
	AP+UG+BP	1	1	0
	AP+UG	1	1	0
	AP	5	1	4
	AP+BP+TS	44	13	31
	AP+TS	9,884	4,256	5,628
	AP+BP	1	0	1

TS+UG+BP	15	8	7
UG+BP	7	6	1
UG	209	146	63
TS+UG	213	143	70
TS+BP	254	171	83
TS	134	102	32
Other	42,586	25,986	16,600

## C. COMPARISON

The aim of this section is to compare the 1979 and 1988 cohorts to show differences in the descriptive variables and reenlistment rates for each cohort. For each of the variable fields examined, a figure that graphically depicts the net change is presented and discussed.

### 1. Net Change in Frequency Percentage

Figure 43 shows the change in frequency between the two cohort groups according to geographic origin. While the percentage of enlistees coming from the North East District dropped sharply (6.5%, the largest movement in any group), that from the North Central, South, and West Districts rose slightly. There was also a small drop off in the percentage of enlistees originating from the "other" category.

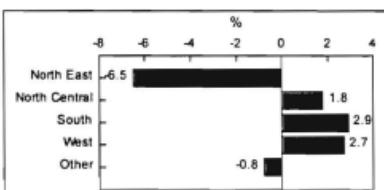


Figure 43. 1979-1988 Net Change -- Enlistment Percentage by Census District.

Between the 1979 and 1988 cohort, as shown in Figure 44, there was a decrease of 6.5% in the 17-year-old age group as a percentage of the total membership. A much smaller drop is also seen for the group comprised of 18-year-olds. There were corresponding increases in the percentage of enlistees 19 years of age or older, with the size of increase generally tapering off as age increased. The mean age for the cohort group changed from 19.28 in 1979 to 19.61 in 1988.

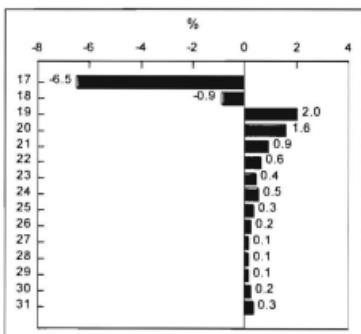


Figure 44. 1979-1988 Net Change -- Enlistment Percentage by Entry Age.

As shown in Figure 45, between 1979 and 1988 there was a substantial increase (16.5%) in the number of enlistees who possessed a high school diploma. There was also a significant decrease in the number of enlistees who had a Graduate Equivalency Diploma (GED). The percentage of enlistees in the cohort group with one or more years of high school dropped from 1979 to 1988. Additionally, the percentage of enlistees with college experience declined between the two cohort years.

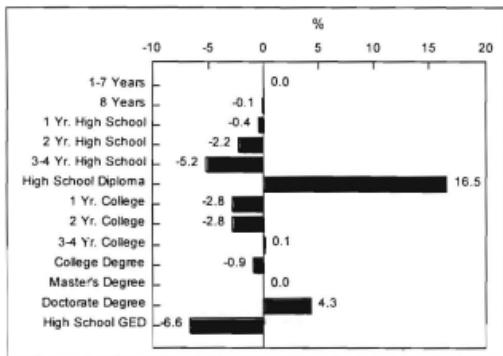


Figure 45. 1979-1988 Net Change -- Enlistment Percentage by Highest Year of Education.

Figure 46 depicts the net change in gender percentage experienced between the 1979 and 1988 cohort groups. As shown in the figure, there was a 1.6% shift from female to male from one group to the other.

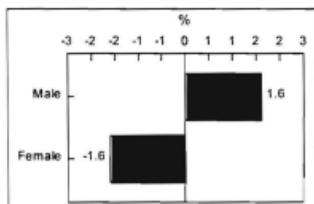


Figure 46. 1979-1988 Net Change -- Enlistment Percentage by Gender.

The net change in percent enlistment by race is depicted in Figure 47. The 4.9% decrease in white enlistment was offset by 3.7% and 1.2% increases in black and other minorities, respectively.

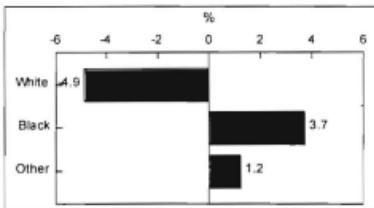


Figure 47. 1979-1988 Net Change -- Enlistment Percentage by Race.

Figure 48 presents the net change in enlistment percentage by marital/dependent status. Between the 1979 and 1988 cohort years, the percentage of married enlistees without dependents increased by 2.5%. This increase was offset by decreases in most of the other categories, most notably in the categories which reflect married enlistees with dependents.

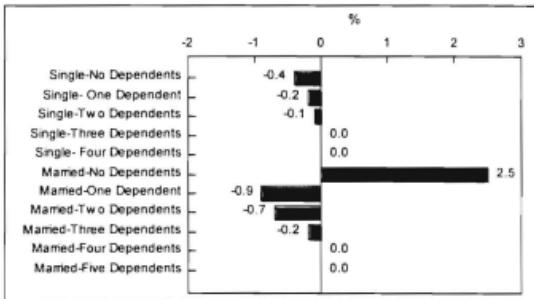


Figure 48. 1979-1988 Net Change -- Enlistment Percentage by Marital/Dependent Status.

Figure 49 presents the net change in enlistment percentage by AFQT grouping. In general, the graph shows that test scores between 31 and 92 percent were more prevalent in the 1988 cohort group than in the 1979 cohort group.

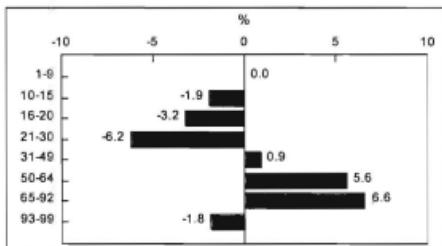


Figure 49. 1979-1988 Net Change -- Enlistment Percentage by AFQT Grouping.

As shown in Figure 50, the change in percentage enlistment by prior service experience indicates small increases in the number of enlistees in the 1988 cohort with no prior service experience or prior service in the Army over that found in the 1979 cohort. There are also uniform decreases in the number of enlistees with prior service in the Navy, Air Force, and Marine Corps, and a much larger decrease in the percentage of enlistees whose records indicate the second "other" category.

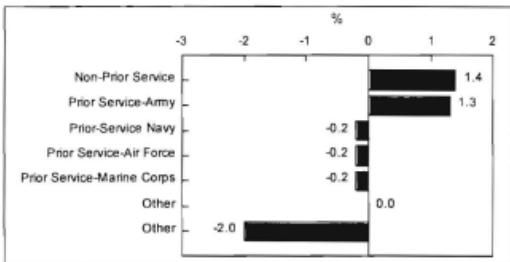


Figure 50. 1979-1988 Net Change -- Enlistment Percentage by Prior Service Experience.

As indicated in Figure 51, the effect of changing enlistment percentages by entry status between 1979 and 1988 was to shift 15.2% of the total cohort from "Direct to Active Duty" to "From DEP, CACHE, etc.".

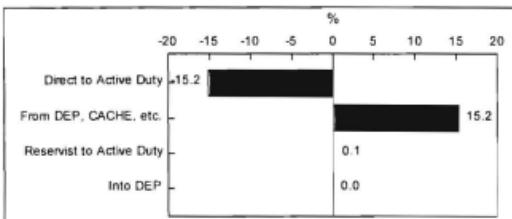


Figure 51. 1979-1988 Net Change -- Enlistment Percentage by Entry Status.

Figure 52 presents the net change in percentage enlistment by entry pay grade between the 1979 and 1988 cohort groups. The percentage of enlistees awarded the pay grade "E3" decreased by 14.3%, offset by a 14% increase in award of E1 and a 0.3% increase in the award for E2.

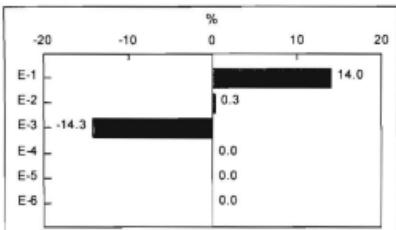


Figure 52. 1979-1988 Net Change -- Enlistment Percentage by Entry Pay Grade.

Of note in the net change in percentage enlistment by enlistment option between the 1979 and 1988 cohort groups, as shown in Figure 53, is the drop in guaranteed advanced enlistment grade. This corresponds to the information presented in Figure 52. This drop seems to be offset by a small increase in the number of enlistees receiving accelerated promotion plus guaranteed training or skill, and a substantial increase in the number of enlistees whose records reflect "other".

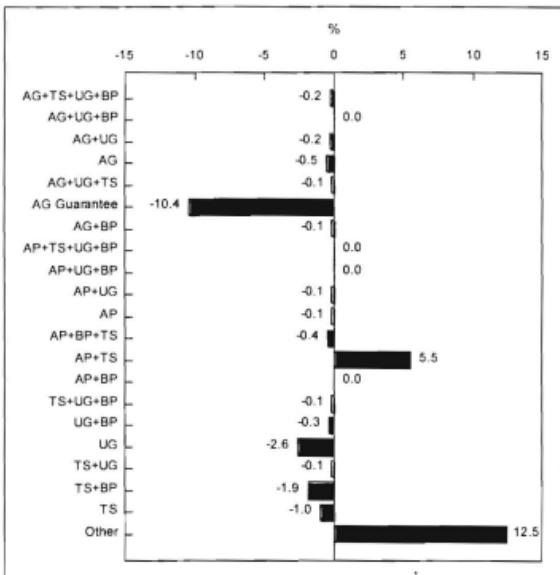


Figure 53. 1979-1988 Net Change -- Enlistment Percentage by Enlistment Option.

## 2. Net Changes in Reenlistment Rates

Overall, the tendency for an enlistee to serve beyond the initial four-year commitment declined from the cohort of 1979 to the cohort of 1988. Among 1979 cohort members, 47.89% chose to reenlist or extend, while 43.69% of the membership of the 1988 cohort reenlisted or extended.

Figure 54 presents a graph which illustrates the net change in the percent of personnel who reenlist by census district of origin. As can be seen in the figure, decreases in the percentage of personnel who reenlisted from the North East, North Central, South, and West Districts are partially offset by an increase in percentage of those who were from "other" areas who reenlisted.

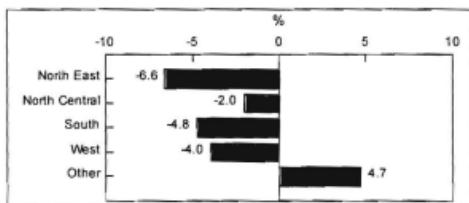


Figure 54. 1979-1988 Net Changes in Reenlistment Rates by Census District.

The change in reenlistment rate by entry age, shown in Figure 55, between the 1979 and 1988 cohorts is greatest for the age of 27 (a drop of 10.4%). The general indication is that the 1988 cohort reenlistment group is made up of younger personnel than the 1979 cohort reenlistment group. Older service members in the 1988 group have relatively larger decreases in their reenlistment rate compared to their counterparts in the 1979 cohort.

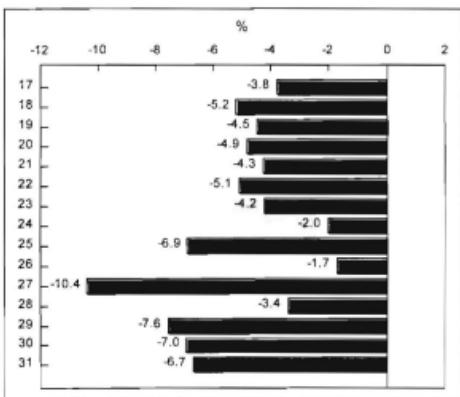


Figure 55. 1979-1988 Net Changes in Reenlistment Rates by Entry Age.

Figure 56 illustrates the change in reenlistment behavior by educational background between the 1979 and 1988 cohorts. The most profound change can be seen in the enlistees with only one year of college education. The percentage of cohort members in this category who continued to serve after four years declined dramatically in the 1988 cohort (55.1%). Generally, there was a decline in reenlistment rates across all of the educational background categories. Only in two categories, "3-4 Years of College" and "Doctorate Degree," were there increases in reenlistment rates.

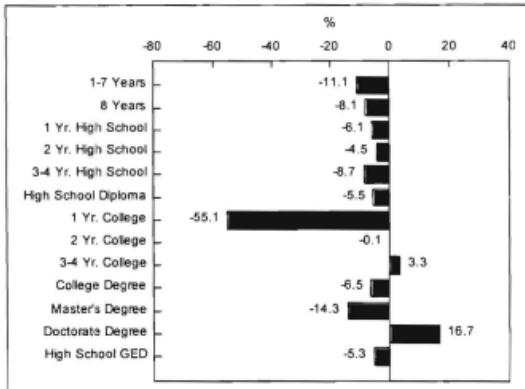


Figure 56. 1979-1988 Net Changes in Reenlistment Rates by Highest Year of Education.

Figure 57 indicates that the reenlistment rate for males declined more than that for females between the two cohort groups. While both categories of enlistee had lower reenlistment rates, it is interesting to note that the decrease in female reenlistment was half that of male reenlistment, while there was a higher percentage of male enlistees in the 1988 cohort group than in the 1979 cohort group, as discussed earlier.

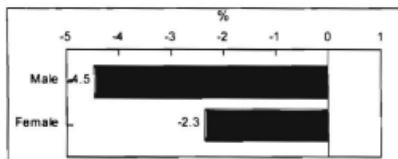


Figure 57. 1979-1988 Net Changes in Reenlistment Rates by Gender.

Figure 58 presents a graph illustrating the net change in percentage reenlistment by marital/dependent status. As the figure shows, reenlistment rates declined more sharply for single enlistees than for married enlistees.

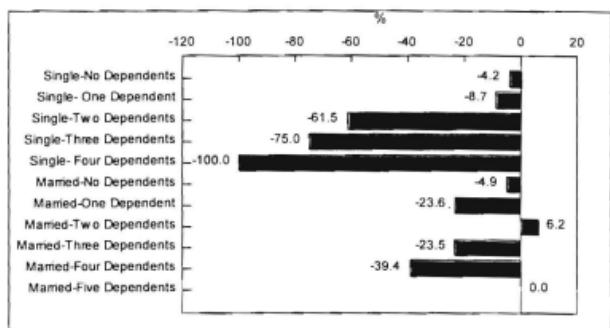


Figure 58. 1979-1988 Net Changes in Reenlistment Rates by Marital/Dependent Status.

Figure 59 illustrates the change in reenlistment rate by AFQT score group. Between the two cohort years, the reenlistment rate declined by a smaller margin as test scores increase. In other words, the decline in reenlistment rates from 1979 to 1988 took place primarily at lower levels of AFQT test scores. Specifically, the lowest test score group (1-9%) experienced the most drastic drop.

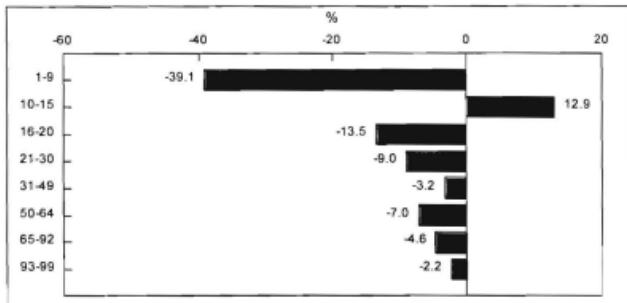


Figure 59. 1979-1988 Net Changes in Reenlistment Rates by AFQT Grouping.

While reenlistment rates declined sharply for all prior service groups between the 1979 and 1988 cohort groups, as shown in Figure 60, the decline in reenlistment for enlistees with no prior service background was remarkably low (3.9%). The high percentage decrease found in the other categories is deceptive, however, as they represent a small percentage of enlistees in both cohort groups.

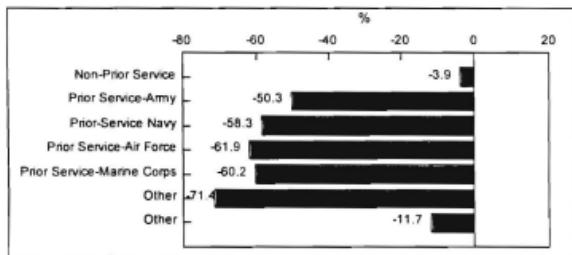


Figure 60. 1979-1988 Net Changes in Reenlistment Rates by Prior Service Experience.

As shown in Figure 61, the decline in reenlistment rates by entry status between the 1979 and 1988 cohort groups is lowest in the category of "Direct to Active Duty". For the categories that reflect enlistees who enter active duty from a program such as DEP, CACHE, etc., from the reserves, or entry into DEP, the drop in reenlistment rate is larger.

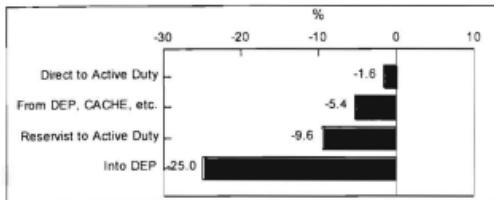


Figure 61. 1979-1988 Net Changes in Reenlistment Rates by Entry Status.

Figure 62 illustrates the net change in reenlistment rate by entry pay grade between the 1979 and 1988 cohort groups. Though there is a small increase in the rate of reenlistment for E2 enlistees, the remaining pay grade groups all indicate a decrease in reenlistment rate between the two cohort groups. This decrease is most profound for pay grade E3, where the reenlistment rate dropped by 4.8% between the cohort years.

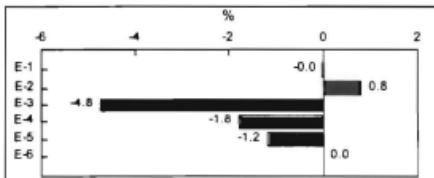


Figure 62. 1979-1988 Net Changes in Reenlistment Rates by Entry Pay Grade.

Figure 63 illustrates the net change in reenlistment rate by enlistment option between the 1979 and 1988 cohort groups. While there are indications of small to large changes in reenlistment rates, the radical differences noted between the make-up of the two cohort groups across these categories, combined with the extremely high percentage of enlistees with option "other," make it difficult to draw any kind of conclusion whatsoever based upon this information. While the 100% decrease in reenlistment by personnel who enlisted with advanced pay grade, unit or geographical guarantee, and buddy program options is surely insignificant (there were no records indicating membership in this category in the 1988 cohort), the small decrease in reenlistment for those in category "other" is probably indicative of the overall slight decline in reenlistment between the two cohort groups.

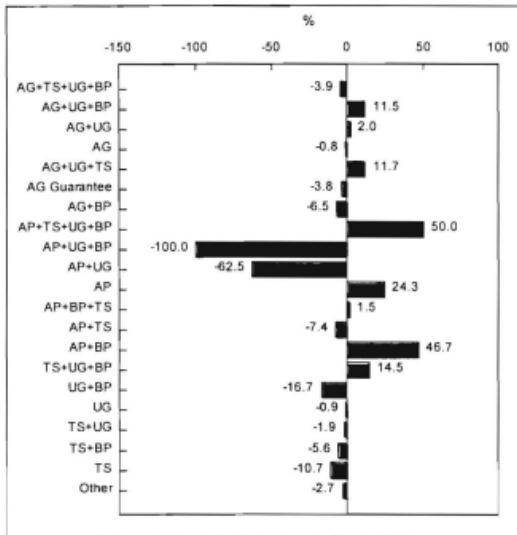


Figure 63. 1979-1988 Net Changes in Reenlistment Rates by Enlistment Option.



## V. LOGIT MODEL RESULTS

This chapter presents the results of LOGIT model analysis of the probability effect of various individual enlistment characteristics on retention after four years. The first section of the chapter discusses the construction of the LOGIT model itself, including the development of binary variables based upon the DMDC dataset variable fields that were found to be significant in Chapter IV. The second and third sections of the chapter present the results of the model constructed for analyzing the 1979 and 1988 cohort files, respectively. The third section of this chapter compares the model results from each cohort year.

### A. MODEL CONSTRUCTION

The following subsections present information on LOGIT model variables, the base case (or reference group), and hypothesized model results. This information is summarized in Appendix C.

#### 1. Variables

In order to construct a LOGIT model, a series of binary variables is created to reflect the enlistment characteristics found in the cohort file. The following binary variables were created based upon the DMDC cohort variable fields (a "yes" or "1" value indicates the variable to be true):

- *SOUTH* -- indicating that the enlistee is from the South Census District or from "other" Census District
- *NOREAST* -- indicating that the enlistee is from the North East Census District
- *CENTRAL* -- indicating that the enlistee is from the North Central Census District
- *WEST* -- indicating that the enlistee is from the West Census District
- *NHSGD* -- indicating that the enlistee is not a high school graduate

- *GED* -- indicating that the enlistee's highest educational achievement is attainment of a Graduate Equivalency Diploma
- *HSGD* -- indicating that the enlistee is a high school graduate
- *COLLEGE* -- indicating that the enlistee has one or more years of college, or a college degree
- *YOUTH* -- indicating that the enlistee is under 17
- *MIDAGE* -- indicating that the enlistee is between 18 and 20, inclusive
- *OLD* -- indicating that the enlistee is over the age of 20
- *MALE*-- indicating that the enlistee is a male
- *FEMALE*-- indicating that the enlistee is a female
- *WHITE* -- indicating that the enlistee's racial classification is "white"
- *BLACK* -- indicating that the enlistee's racial classification is "black"
- *OTHERACE* -- indicating that the enlistee's racial classification is other than "white" or "black"
- *SNDEP* -- indicating that the enlistee is single with no dependents
- *PWDEP* -- indicating that the enlistee has dependents
- *MNDEP* -- indicating that the enlistee is married with no dependents
- *NONPSENV* -- indicating that the enlistee has no prior service record
- *PSERV* -- indicating that the enlistee has a prior service record
- *NFROMDEP* -- indicating that the enlistee has not entered the service from the Delayed Entry Program, the CACHE program, etc.
- *FROMDEP* -- indicating that the enlistee has entered the service from the Delayed Entry Program, the CACHE program, etc.
- *CATI* -- indicating that the enlistee has an AFQT score in Category I (93-99%)
- *CATII* -- indicating that the enlistee has an AFQT score in Category II (65-92%)
- *CATIIIA* -- indicating that the enlistee has an AFQT score in Category IIIA (50-64%)
- *CATIIIB* -- indicating that the enlistee has an AFQT score in Category IIIB (1-49%)
- *OTHEROPT* -- indicating that the subject enlisted with "other" enlistment options
- *ADVGRADE* -- indicating that the subject enlisted with the "advanced enlistment grade" option
- *ACCPROMO* -- indicating that the subject enlisted with the "accelerated promotion" option
- *GUATRAIN* -- indicating that the subject enlisted with the "guaranteed training" option
- *GEOGRAPH* -- indicating that the subject enlisted with the "guaranteed unit or geographic location" option

## 2. Base Case

In accordance with established procedures for constructing a LOGIT model (see Chapter III), a "base case" was chosen to provide a reference point from which to determine probabilities for the remaining variables. In this instance, the base case describes an enlistee who is:

- From the South or Other Census Districts
- Not a high school graduate (or recipient of a GED)
- Between the ages of 18 and 20, inclusive
- Male
- White
- Single with no dependents
- Not a prior service member
- Not enlisting from the Delayed Entry Program, CACHE, etc.
- In AFQT Category IIIB (1-49%)
- Enlists with "other" enlistment option(s)

## 3. Hypothesized Results

For the remaining variables (those not expressed in the base case), there are expected effects on reenlistment probabilities. These hypothesized effects are expressed below by a "+" or "-" to indicate, respectively, a positive or negative effect on reenlistment probability:

- *NOREAST* -
- *CENTRAL* -
- *WEST* -
- *GED* +
- *HSGD* +
- *COLLEGE* +
- *YOUTH* -
- *OLD* +
- *FEMALE* -
- *BLACK* +
- *OTHERACE* +

- *PWDEP* +
- *MNDEP* +
- *PSERV* +
- *FROMDEP* +
- *CATI* +
- *CATII* +
- *CATIIIA* +
- *ADVGRADE* +
- *ACCPROMO* +
- *GUATRAIN* -
- *GEOGRAPH* -

## B. 1979 COHORT MODEL RESULTS

Due to the fact that the data in the cohort files was reorganized into binary (or "dummy") variables for use in the LOGIT model, the revised distributions for each model variable category are presented below.

Figure 64 illustrates the distribution of origin by census district for each of the dummy variables used to reflect the geographic origin of enlistees.

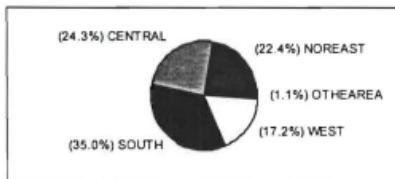


Figure 64. 1979 LOGIT Model Variables: Distribution by Census District.

Figure 65 shows the breakdown of the category of variables which reflect the age of enlistees. The vast majority of the 1979 cohort (66.6%) reflect membership in the "MIDAGE" group, and "OLD" and "YOUTH" account for 19.7% and 13.8% of the total, respectively.

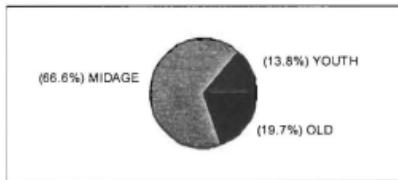


Figure 65. 1979 LOGIT Model Variables: Distribution by Age Group.

The majority of the 1979 cohort, as shown in Figure 66, are high school graduates (72%). The next largest group (12.8%) are non-high school graduates, while individuals with some college experience and individuals with a high school GED make up 8.4% and 6.8% of the sample, respectively.

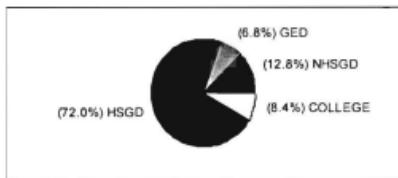


Figure 66. 1979 LOGIT Model Variables: Distribution by Education.

Figure 67 shows that males represent 87.6% of the sample for the 1979 cohort, while females account for only 12.4%.

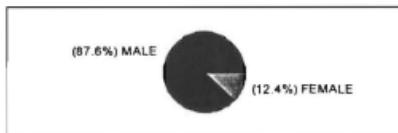


Figure 67. 1979 LOGIT Model Variables: Distribution by Gender.

In Figure 68, one can see that whites make up the majority of the 1979 cohort (84.2%), while blacks and other minorities account for 13.6% and 2.2%, respectively.

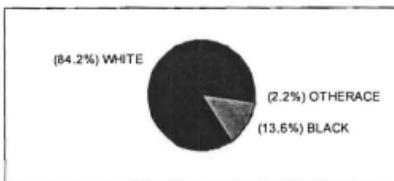


Figure 68. 1979 LOGIT Model Variables: Distribution by Race.

The three binary variable groups created to represent marital/dependent status are represented in Figure 69. The largest group (94.6%) are single, with no dependents, while enlistees with dependents (2.2%) and married enlisted without dependents (3.2%) represent much smaller minorities.

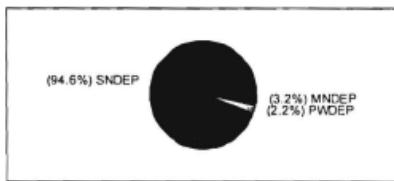


Figure 69. 1979 LOGIT Model Variables: Distribution by Marital/Dependent Status.

The largest portion of the 1979 cohort depicted in Figure 70 are those in Category II (38.5%). A slightly smaller percentage are in Category IIIB (30.6%), while Categories IIIA and I account for the remainder (21.6% and 9.2%, respectively).

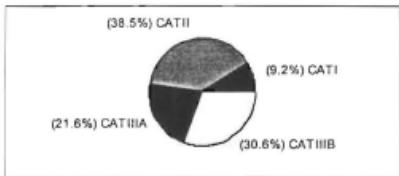


Figure 70. 1979 LOGIT Model Variables: Distribution by AFQT Category.

Almost all of the 1979 cohort membership had no prior service record, as shown in Figure 71. Only 3.4% of the cohort had a prior service background.

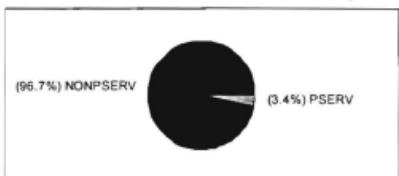


Figure 71. 1979 LOGIT Model Variables: Distribution by Prior Service Record.

The majority of the 1979 sample group show membership in the "FROMDEP" category (83.9%). Only 16.1% fall into the "NFROMDEP" group.

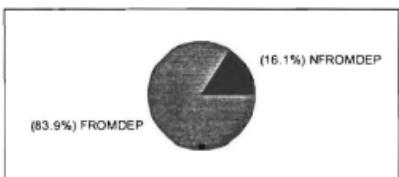


Figure 72. 1979 LOGIT Model Variables: Distribution by DEP Status.

Figure 73 shows the distribution of the 1979 cohort across the model variables intended to reflect enlistment options. As is apparent in the figure, the majority of enlistees (59.5%) are in the "OTHEROPT" category.

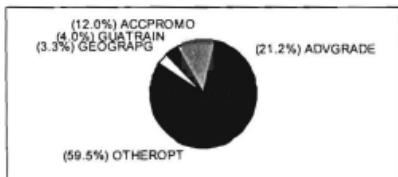


Figure 73. 1979 LOGIT Model Variables: Distribution by Enlistment Option.

Table 3 presents the results of the LOGIT model for the 1979 cohort.

TABLE 3. Coefficients for Cohort 1979 First Term  
Reenlistment

Number of Observations : 49831

Number which Reenlisted : 23865

Variable	Expected Sign	Coefficient	Error	Probability @
INTERCPT		-1.1207	0.0410	-0.5367
NOREAST	-	-0.0045	0.0253	-0.0021
CENTRAL	-	-0.1470	0.0249	-0.0704 *
WEST	-	-0.0215	0.0280	-0.0103
GED	+	-0.0526	0.0465	-0.0252
HSGD	+	0.4871	0.0308	0.2333 *
COLLEGE	+	0.3691	0.0479	0.1768 *
YOUTH	-	-0.0604	0.0289	-0.0289 **
OLD	+	0.0055	0.0276	0.0026
FEMALE	-	-0.1213	0.0290	-0.0581 *
BLACK	+	0.4577	0.0289	0.2192 *
OTHERACE	+	0.3469	0.0636	0.1661 *
PWDEP	+	0.1664	0.0658	0.0797 *
MNDEP	+	0.1138	0.0547	0.0545 **
PSERV	+	0.3031	0.0558	0.1452 *
FROMDEP	+	0.2933	0.0267	0.1405 *
CATI	+	0.5280	0.0405	0.2529 *
CATII	+	0.3510	0.0242	0.1681 *
CATIIIA	+	0.1604	0.0267	0.0768 *
ADVGRADE	+	0.6070	0.0257	0.2907 *
ACCPROMO	+	0.7320	0.0321	0.3506 *
GUATRAIN	-	-0.1764	0.0488	-0.0845 *
GEOGRAPH	-	-0.2839	0.0559	-0.1360 *

Chi-Square = 3332.388 with 22 Degrees of Freedom

Concordance ratio = 64.1%

\* Significant at the 99 Percent Confidence Level

\*\* Significant at the 95 Percent Confidence Level

@ Probabilities calculated using  $B(P)(1-P)$

This model was tested to ensure freedom from problems of multi-colinearity. The model results indicate several variables that have a negative influence on the probability of reenlistment. Being from the North Central Census District meant that a member of the 1979 cohort was significantly less likely to reenlist. Being a member of the group identified by "YOUTH" (e.g., being 17 years of age) also meant a significant decrease in the probability of reenlistment, as did being a female, receiving guaranteed training as an enlistment option, and receiving a unit or geographic duty station guarantee. Each of these negative influences on probability was significant at the 95 percent confidence level, with the exception of being 17 years of age, which was significant at the 99 percent confidence level. Other variables that lowered reenlistment probability, but were not statistically significant, were: being from the North East Census District, being from the West Census District, and having a high school GED.

Positive influences on probability of retention are also present in the model results. Being a high school graduate increased the probability of retention after four years. Surprisingly, and in contradiction to previous findings as presented in Chapter II, being a college graduate increased the probability of service beyond the four-year mark for the 1979 cohort. This finding was significant at the 95 percent confidence level. The portion of the sample described by the variable "OLD" were also more likely to reenlist than their counterparts, even though this level of probability was not significant. Being black or being from another race also made it more probable that an enlistee would reenlist, and both of these increases in probability were significant at the 95 percent confidence level. Being an enlistee with dependents increased the probability of

reenlistment, and this increase was significant at the 95 percent confidence level. Married enlistees who had no dependents were more likely to reenlist, according to the model results, and this result was significant at the 99 percent confidence level. Having a prior service background, and entering active duty from the DEP were both characteristics that increased the probability of reenlistment, and these probabilities were both significant at the 95 percent confidence level. An AFQT score that placed an enliste in Categories I, II, and IIIA, having an advanced grade upon enlistment, and having guaranteed accelerated promotion as an enlistment option all increased the probability of reenlistment, and all of these observations were significant at the 95 percent confidence level.

### C. 1988 COHORT MODEL RESULTS

Figure 74 illustrates the makeup of the 1988 cohort group in terms of the LOGIT model variables. The largest portion of the sample is represented by the "SOUTH" variable (37.9%). The "CENTRAL" variable group accounts for the next highest percentage of the total sample (26.1%), while "WEST", "NOREAST", and "OTHEAREA" are responsible for 19.9%, 15.9%, and 0.3% of the sample, respectively.

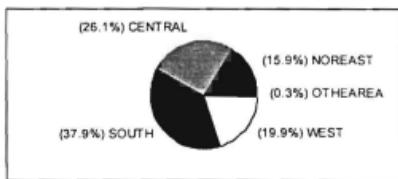


Figure 74. 1988 LOGIT Model Variables: Distribution by Census District.

Figure 75 represents the distribution of the 1988 cohort sample across the variables intended to represent age group. The majority of the 1988 sample (69.3%) fall into the group represented by "MIDAGE", followed by the "OLD" group (23.3%) and the "YOUNG" group (7.3%).

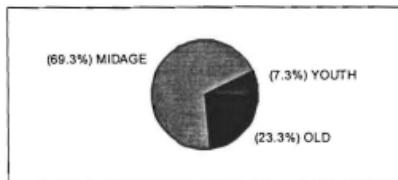


Figure 75. 1988 LOGIT Model Variables: Distribution by Age Group.

Education is reflected by the variables depicted in Figure 76. As with the 1979 cohort group, the majority of the sample are in the category representing high school graduates (88.5%). The remainder of the sample fall into the categories reflecting high school GED (4.5%), non-high school graduate (4.9%), and some college (2.1%).

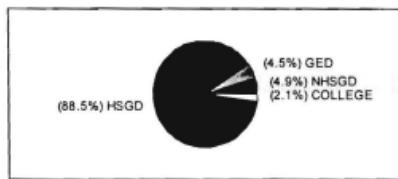


Figure 76. 1988 LOGIT Model Variables: Distribution by Education.

Figure 77 shows the distribution of the 1988 sample across the model variables reflecting gender. Males account for 89.2% of the total, while females make up only 10.8%.

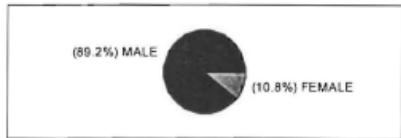


Figure 77. 1988 LOGIT Model Variables: Distribution by Gender.

Figure 78 shows the distribution of the 1988 cohort sample across the variables reflecting race. The majority of the sample reflects an affirmative value for the variable "WHITE" (79.3%), while blacks and other races account for 17.3% and 3.4% of the sample, respectively.

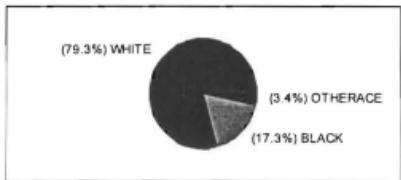


Figure 78. 1988 LOGIT Model Variables: Distribution by Race.

Figure 79 presents the percentage make up of the 1988 cohort sample by the LOGIT model variables intended to reflect marital/dependent status. The majority of the sample reflects membership in the category representing single enlistees with no dependents (94.2%), while married enlisted with no dependents and enlisted with dependents account for 5.7% and a very low 0.1% of the sample, respectively.

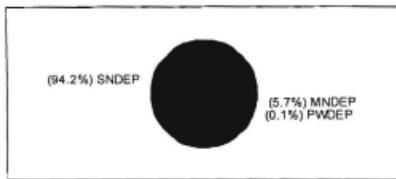


Figure 79. 1988 LOGIT Model Variables: Distribution by Marital/Dependent Status.

The distribution of the 1988 cohort sample across LOGIT model variables intended to reflect AFQT score grouping is depicted in Figure 80. The largest single group in the sample are in CATII (40.9%), while CATIIB, CATIIIA, and CATI account for 27.9%, 24.9%, and 6.3% of the sample, respectively.

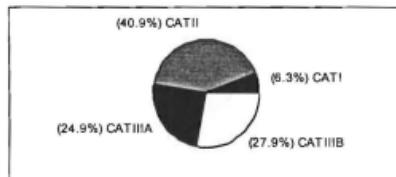


Figure 80. 1988 LOGIT Model Variables: Distribution by AFQT Category.

As shown in Figure 81, almost all of the 1988 cohort sample is represented by the model variable representing no prior service experience (98.0%). Only 2.0% of the sample reflect a value of 1 for the model variable "PSERV."

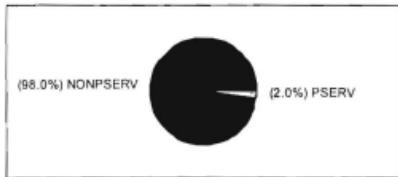


Figure 81. 1988 LOGIT Model Variables: Distribution by Prior Service Record.

As illustrated in Figure 82, almost all of the 1988 cohort sample fall into the category represented by the model variable "FROMDEP" (99.1%), indicating that the enlistees entered active duty from a program such as DEP or CACHE. Only 0.9% of the sample are represented in the variable "NFROMDEP".

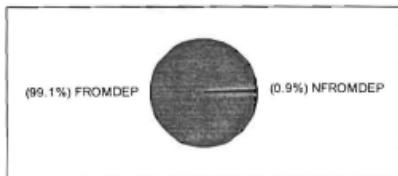


Figure 82. 1988 LOGIT Model Variables: Distribution by DEP Status.

As shown in Figure 83, the majority of the 1988 cohort sample are represented by the model variable "OTHEROPT," reflecting the category of enlistment option represented in the DMDC cohort file as "Other".

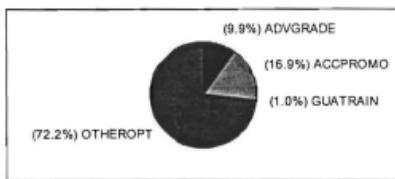


Figure 83. 1988 LOGIT Model Variables: Distribution by Enlistment Option.

Table 4 presents the LOGIT model results for the 1988 cohort group.

TABLE 4. Coefficients for Cohort 1988 First Term Reenlistment

Number of observations : 59173

Number which reenlisted : 25853

Variable	Expected Sign	Coefficient	Error	Probability @
INTERCPT		-1.5320	0.1012	-0.6693
NOREAST	-	-0.1179	0.0258	-0.0515 *
CENTRAL	-	-0.0859	0.0220	-0.0375 *
WEST	-	0.0147	0.0242	0.0064
GED	+	0.2193	0.0612	0.0958 *
HSGD	+	0.8045	0.0463	0.3515 *
COLLEGE	+	0.8750	0.0766	0.3823 *
YOUTH	-	-0.1276	0.0344	-0.0557 *
OLD	+	0.0754	0.0219	0.0329 *
FEMALE	-	-0.0769	0.0278	-0.0336 *
BLACK	+	0.3240	0.0242	0.1416 *
OTHERACE	+	0.3861	0.0472	0.1687 *
PWDEP	+	-0.0825	0.2816	-0.0360
MNDEP	+	0.1691	0.0379	0.0739 *
PSERV	+	0.0072	0.0607	0.0031
FROMDEP	+	0.0638	0.0902	0.0279
CATI	+	0.8106	0.0408	0.3542 *
CATII	+	0.5131	0.0229	0.2242 *
CATIIIA	+	0.1989	0.0246	0.0869 *
ADVGRADE	+	0.4852	0.0299	0.2120 *
ACCPROMO	+	0.5022	0.0247	0.2194 *
GUATRAIN	-	-0.2775	0.0886	-0.1212 *
GEOGRAPH	-	-0.3423	0.1513	-0.1496 **

Chi-Square = 2943.629 with 22 Degrees of Freedom

Concordance ratio = 62.1%

\* Significant at the 99 percent confidence level

\*\* Significant at the 95 percent confidence level

@ Probabilities calculated using  $B(P)(1-P)$ 

This model was tested to ensure freedom from problems of multi-colinearity. The most drastic positive influences in reenlistment probability for reenlistment for the 1988

cohort group LOGIT model were found to be college experience, being a high school graduate, and being in the top category of AFQT scores. Once again, this refutes the contentions of previous studies regarding the negative effect on probability of retention created by higher levels of education or higher mental ability (as measured by test scores).

Negative effects on probability were found to derive from the following characteristics: being from the North East or Central Census Districts, being 17 years of age or younger, being female, and having guaranteed training or skill or unit or geographic location as enlistment options.

#### **D. COMPARISON**

Figure 84 depicts the change in distribution of cohort membership across the LOGIT model variables between the 1979 and 1988 cohort groups. The geographic distribution of enlistees shifted from the Northeast Census District, and, to a lesser degree, from other areas, to the Central, South, and West Census Districts. The proportion of 17 year olds (marked by "YOUTH") dropped, to be replaced by more enlistees in the old and mid-age groups. The percentage of non-high school graduates, enlistees with college experience, and, somewhat less so, GED recipients were displaced by a sharp increase (16.8%) in high school graduates. The gender makeup of the cohort groups shifted from female to male by 1.56%. White enlistment was down, offset by enlistment of blacks and other minority races. The percentages of single enlistees with no dependents and enlistees with dependents diminished, with a corresponding increase in the percentage of married enlistees with no dependents. While the highest category of

AFQT score fell slightly as a percentage of the total cohort make-up, the percentage in the two successive categories increased sharply. Enlistees with no prior service background increased slightly over those with prior service backgrounds. There were more personnel in the 1988 cohort arriving to active duty from the DEP. The percentage of the cohort group with advanced enlistment grade as an enlistment option was down significantly in 1988, those with guaranteed training and geographic or unit location were slightly lower, and those with accelerated promotion slightly higher. The percentage of cohort members with "other" enlistment options was markedly higher. Overall, reenlistment declined between the two cohort groups by approximately 4.2%.

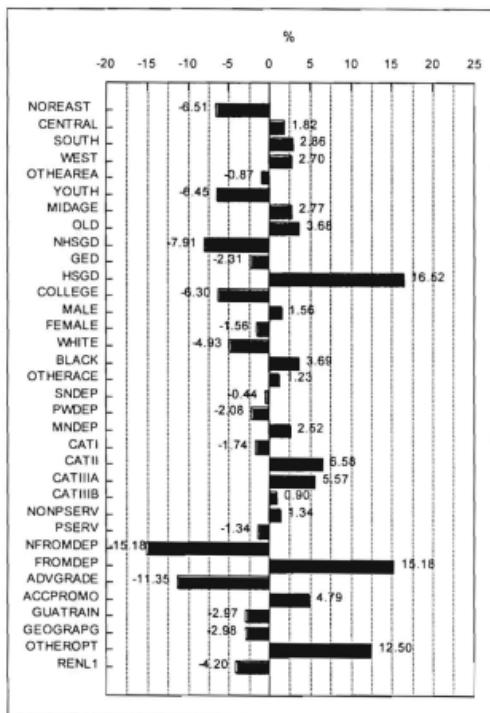


Figure 84. LOGIT Model Variables: 1979-1988 Net Change in Distribution.

Table 5 compares the LOGIT model results for the two cohort groups. It is apparent that the propensity for someone to reenlist who was from the North East Census District declined over the years, though the negative impact of being from this census district was only significant at the 95 percent confidence level for the 1988 cohort.

Someone from the Central Census District, however, was significantly less likely to reenlist in either cohort group, although the degree of this change in probability was less severe for the 1988 group. From a small (but insignificant) decrease in probability for reenlistment to a small (but still insignificant) increase in probability, there was only a small change for the influence of being from the West Census District. While having a high school graduate equivalency diploma had a negative yet insignificant effect on probability of reenlistment in the 1979 cohort, the effect was significant and positive for the 1988 cohort. Being a high school graduate and having some college experience were responsible for significant increases in probability for both cohort years, and the level of increase in probability was up from the 1979 cohort to the 1988 cohort. Enlistees who were 17 years of age at entry into active duty were even less likely to reenlist after four years if they joined in 1988 than they were if they joined in 1979. Females were less likely to reenlist for both cohort groups, though this effect was less in the 1988 cohort group. While being black increased the probability of reenlistment in both cohort groups, this effect was less pronounced in 1988 than it was in 1979, this trend was repeated for other races as well. The net effect on reenlistment rates for enlistees having dependents changed between the 1979 cohort group and the 1988 cohort group from a slight decrease in probability to a slight increase in probability. Married enlistees with no dependents were slightly less likely to reenlist in the 1988 cohort group than they were in the 1979 cohort group, though in both instances the effect was to increase the probability of reenlistment. Prior service experience continued to be a stimulus to reenlistment probability in the 1988 cohort, but less so than it had been in 1979. A similar movement

was present for enlistees. The tendency toward reenlistment exhibited by enlistees with AFQT scores in Categories I, II, and IIIA was maintained and increased. This increase in probability for reenlistment increased along with test scores, which sharply contradicts previous study findings as presented in Chapter II. The increase in probability of reenlistment due to advanced pay grade on enlistment was somewhat lower in the 1988 cohort group than it had been in the 1979 cohort group, and while accelerated promotion options continued to increase the probability of retention from one cohort to the other, the impact was less in 1988 than it had been in 1979. Finally, the decrease in reenlistment probabilities attributable to the enlistment options for guaranteed training and unit or geographic location guarantee was more pronounced in 1988 than in 1979.

TABLE 5. Comparison of Logit Model Results, 1979-1988.

Variable	Expected Sign	Cohort 79	Cohort 88	79 to 88
		Change in Probability	Change in Probability	Change in Probability
NOREAST	-	-0.0021	-0.0515*	-0.0494
CENTRAL	-	-0.0704*	-0.0375*	0.0329***
WEST	-	-0.0103	0.0064	0.0167
GED	+	-0.0252	0.0958*	0.1210
HSGD	+	0.2333*	0.3515*	0.1182***
COLLEGE	+	0.1768*	0.3823*	0.2055***
YOUTH	-	-0.0289**	-0.0557*	-0.0268***
OLD	+	0.0026	0.0329*	0.0303
FEMALE	-	-0.0581*	-0.0336*	0.0245***
BLACK	+	0.2192*	0.1416*	-0.0776***
OTHERACE	+	0.1661*	0.1687*	0.0026***
PWDEP	+	0.0797*	-0.0360	-0.1157
MNDEP	+	0.0545**	0.0739*	0.0194***
PSERV	+	0.1452*	0.0031	-0.1420
FROMDEP	+	0.1405*	0.0279	-0.1126
CATI	+	0.2529*	0.3542*	0.1013***
CATHI	+	0.1681*	0.2242*	0.0561***
CATHIIA	+	0.0768*	0.0869*	0.0101***
ADVGRADE	+	0.2907*	0.2120*	-0.0787***
ACCPROMO	+	0.3506*	0.2194*	-0.1312***
GUATRAIN	-	-0.0845*	-0.1212*	-0.0368***
GEOGRAPH	-	-0.1360*	-0.1496**	-0.0136***

\* Significant at the 99 Percent Confidence Level

\*\* Significant at the 95 Percent Confidence Level

\*\*\* Both Significant above the 95% Confidence Level for 79' and 88'

## VI. CONCLUSIONS AND RECOMMENDATIONS

The initial objectives of this research were to identify background characteristics of the 1979 and 1988 enlisted cohorts, as recorded in the DMDC cohort data files, and to attempt to correlate those characteristics to retention data. It was hoped that this would provide conclusions about the influence and significance of said characteristics on the probability of retention after an initial four years contract. A further objective was to examine the change observed in the enlistment characteristics between the 1979 and 1988 cohort groups.

Chapter II presented a review of several previous studies in the subject area. It was noted that studies examined both objective data, such as age upon enlistment and educational background, and subjective data, such as job satisfaction. Some of these studies employed objective data; while some relied upon the use of surveys to collect information upon which to make analysis and base conclusions. Among the results of note were the following: personnel with higher levels of education have been found to have a significantly lower probability of reenlistment; married service members, and service members with dependent children, have been found to be significantly more likely to reenlist than unmarried personnel or personnel with no dependent children; males have been considered more likely to reenlist than females; and minorities have been found to be more likely to reenlist than whites.

Chapter IV discussed the preliminary analysis of data found in the 1979 and 1988 cohort files. In 1979, the largest percentage of enlistees for each variable category examined were: from the South Census District; 18 years of age; high school graduates.

male; white; single with no dependents; in the AFQT score range of 65-92%; non-prior service; from a program such as DEP, CACHE, etc.; enlisted at pay grade E-1; and, had "other" enlistment options. The highest reenlistment rates were found to be the following groups for each category: "other" Census District; 30 years of age; college graduate; male; single with four dependents; AFQT score range of 93-99%; "other" prior service background; reservist to active duty; pay grade E-6; advanced promotion, unit or geographic location guarantee, and buddy program enlistment option. The most notable change in frequency for the 1988 cohort was that the increase in the percentage of enlistees was found in the AFQT score range of 65-92%. The changes in highest reenlistment rates for each category observed for the 1988 group were: a shift from college graduate to 3-4 years of college; reenlistment rates being equal for males and females; a shift from single with four dependents to single with six dependents, and; for enlistment options, advanced promotion plus buddy program rising to equal the reenlistment rate for advanced promotion, guaranteed training or skill, unit or geographic location, and buddy program.

From 1979 to 1988, the following additional changes in frequency were noted: a sharp decline in enlistees coming from the North East Census District; the median age at enlistment increased from 19.28 in 1979 to 19.61 in 1988, and there was a sharp drop in the enlistment of 17-year-olds; the percentage of high school graduates was up, while the percentage of GED recipients was down; white enlistment declined in favor of minority enlistment; there was a higher percentage of married enlistees with no dependents; there were higher percentages of enlistees in the top half of AFQT scores, and fewer in the

bottom half; there was an increase in percentage of enlistees with no prior service experience or with prior service in the Army; a higher percentage of enlistees came from DEP; and, there were fewer personnel enlisting with pay grade E-3.

Between 1979 and 1988, the following changes in the reenlistment rates for the variable categories were noted: higher rates for "other areas", and lower rates for all of the other Census Districts; higher rates for younger personnel, and lower rates for older personnel; lower rates across the board in the education category; a drop in the rate of male reenlistment that is twice that of the drop in female reenlistment; significant decreases in the reenlistment rate for lower AFQT scores, and much smaller decreases in the reenlistment rates for higher AFQT scores; declines across the board in the prior service and entry status categories, and; declines in the rates for the entry pay grade category for every value except pay grade E-2.

Significant influences on the probability of reenlistment were obtained through the use of a LOGIT regression model, as discussed in Chapter V. In 1979, the following characteristics meant that an enlistee was significantly less likely to reenlist: being from the North Central Census District, being 17 years of age, being a female, and receiving guaranteed training and unit or geographical location guarantees as enlistment options. Significant increases in the probability for reenlistment were found for the following characteristics: being a high school graduate, having college experience, being older, being a minority, having dependents, being married with no dependents, having a prior service background, entering active duty from DEP, and having an AFQT score in the top three score ranges.

In 1988, college experience, being a high school graduate, and being in the top category of AFQT scores again had a positive effect on the probability for reenlistment. Similarly, negative influences on probability were found to occur as a result of being from the North East or Central Census Districts, being 17 years old, being female, and receiving guaranteed training and unit or geographical location guarantees as enlistment options.

Because of the inconsistencies identified in the cohort data files, it is recommended that no recruiting policy decisions be made upon the basis of these results until they are confirmed by a broader analysis. Further, it is recommended that the cohort data files be reviewed to ensure the accuracy of values contained in the variable fields. Once this is accomplished, an interesting research objective for future study would be to examine the changing characteristics of the cohort group over the first four years of enlistment using the yearly update fields contained in the cohort files. It would be useful to know how, for instance, *changes* in marital or educational status affect the probability of retention after four years. This was attempted during the course of this research, but inconsistencies in the data set prevented meaningful results.

Despite the above, it can be said that the conventional wisdom regarding retention of individuals with "higher mental capacity" and higher levels of education should be reviewed. The results of this thesis indicate that it is precisely these individuals who are most likely to be retained after the first four years of service. Additionally, due to the abundance of recommendations found in the literature review, it is possible to recommend continuing the Navy's emphasis on quality-of-life programs, though no

examination of the results of such programs is possible with the data employed in this work.

## APPENDIX A. LOGIT MODEL CODE

For the 1979 LOGIT model:

```
//THESES79 JOB USER=S1643,CLASS=C
// EXEC SAS
//WORK DD UNIT=SYSDA,SPACE=(CYL,(380,140),RLSE)
//SASIN DD DISP=SHR,DSN=MSS.N8067.COHORT79
//SYSIN DD *
OPTION LINESIZE = 80 MEMSIZE = 30M NODATE;

DATA ONE;
  SET SASIN.COHORT79(READ=TRACK);

IF ACCESSVC = 2;
IF ENLTERM = 4;
IF ENTRYAGE >= 17 AND ENTRYAGE <= 31;
IF AFQTGRPS > 0;
IF ENLOPT > 0;
IF CDISTRCT > 0;
IF HIYREDUC > 0;
IF SEX > 0;
IF RACE > 0;
IF MARST_DP > 0;
IF ENTRSTAT > 0;
IF ENTRGRAD > 0 AND ENTRGRAD <= 6;
IF ETHNIC > 0;

ENTRY_M = ENTRYDTY*12 + ENTRYDTM;

IF ENTRY_M >= 946 AND ENTRY_M <= 957;

SEP_M = SEPDAT_Y*12 + SEPDAT_M;

IF SEP_M >= 1 THEN STAY_M = SEP_M - ENTRY_M;
```

```
ELSE IF SEP_M = 0 AND ENTRYDTM >= 10
    THEN STAY_M = (10 * 12 + 10) + (12 - ENTRYDTM);
ELSE IF SEP_M = 0 AND ENTRYDTM < 10
    THEN STAY_M = (10 * 12 + 1) + (9 - ENTRYDTM);

IF STAY_M >= 49 THEN RENL1 = 1; ELSE RENL1 = 0;

IF CDISTRCT = 1 THEN NOREAST = 1; ELSE NOREAST = 0;
IF CDISTRCT = 2 THEN CENTRAL = 1; ELSE CENTRAL = 0;
IF CDISTRCT = 3 THEN SOUTH = 1; ELSE SOUTH = 0;
IF CDISTRCT = 4 THEN WEST = 1; ELSE WEST = 0;
IF CDISTRCT = 5 THEN OTHEAREA= 1; ELSE OTHEAREA = 0;

IF ENTRYAGE = 17 THEN YOUTH = 1; ELSE YOUTH = 0;
IF ENTRYAGE >= 18 AND ENTRYAGE <= 20 THEN MIDAGE = 1;
    ELSE MIDAGE = 0;
IF ENTRYAGE >= 21 THEN OLD = 1; ELSE OLD = 0;

IF HIYREDUC <= 5 THEN NHSGD = 1; ELSE NHSGD = 0;
IF HIYREDUC = 6 THEN HSGD = 1; ELSE HSGD = 0;
IF HIYREDUC >= 7 AND HIYREDUC <= 12 THEN COLLEGE = 1;
    ELSE COLLEGE = 0;
IF HIYREDUC = 13 OR HIYREDUC = 14 THEN GED = 1; ELSE GED = 0;

IF SEX = 1 THEN MALE = 1; ELSE MALE = 0;
IF SEX = 2 THEN FEMALE = 1; ELSE FEMALE = 0;

IF RACE = 1 THEN WHITE = 1; ELSE WHITE = 0;
IF RACE = 2 THEN BLACK = 1; ELSE BLACK = 0;
IF RACE = 3 THEN OTHERACE = 1; ELSE OTHERACE = 0;

IF MARST_DP = 10 THEN SNDEP = 1; ELSE SNDEP = 0;
IF MARST_DP >= 11 AND MARST_DP <= 19 OR MARST_DP >= 21 AND
    MARST_DP <= 29 THEN PWDEP = 1; ELSE PWDEP = 0;
IF MARST_DP = 20 THEN MNDEP = 1; ELSE MNDEP= 0;
```

```
IF AFQTGRPS = 8 THEN CATI = 1 ; ELSE CATI = 0;
IF AFQTGRPS = 7 THEN CATII = 1 ; ELSE CATII = 0;
IF AFQTGRPS = 6 THEN CATIIIA = 1 ; ELSE CATIIIA = 0;
IF AFQTGRPS >= 1 AND AFQTGRPS <= 5 THEN CATIIIB = 1 ;
ELSE CATIIIB = 0;

IF PRIORSVC = 1 THEN NONPSERV = 1; ELSE NONPSERV = 0;
IF PRIORSVC > 1 THEN PSERV = 1; ELSE PSERV = 0;

IF ENTRSTAT = 2 THEN FROMDEP = 1; ELSE FROMDEP = 0;
IF ENTRSTAT NE 2 THEN NFROMDEP = 1; ELSE NFROMDEP = 0;

IF ENLOPT >= 1 AND ENLOPT <= 7 THEN ADVGRADE = 1;
ELSE ADVGRADE = 0;
IF ENLOPT >= 8 AND ENLOPT <= 14 THEN ACCPROMO = 1;
ELSE ACCPROMO = 0;
IF ENLOPT = 15 OR ENLOPT >= 18 AND ENLOPT <= 20 THEN GUATRAIN = 1;
ELSE GUATRAIN = 0;
IF ENLOPT >= 16 AND ENLOPT <= 17 THEN GEOGRAPH = 1;
ELSE GEOGRAPH = 0;
IF ENLOPT = 21 THEN OTHEROPT = 1; ELSE OTHEROPT = 0;

REENLIST = 1 - RENL1;

PROC LOGISTIC;
  MODEL REENLIST = NOREAST CENTRAL WEST GED HSGD COLLEGE YOUTH OLD
                  FEMALE BLACK OTHERACE PWDEP MNDEP PSERV FROMDEP
                  CATI CATII CATIIIA ADVGRADE ACCPROMO GUATRAIN
                  GEOGRAPH;
/* */
//
```

For the 1988 LOGIT model:

```
//THESIS88 JOB USER=S1643,CLASS=C
// EXEC SAS
//WORK DD UNIT=SYSDA,SPACE=(CYL,(380,140),RLSE)
//SASIN DD DISP=SHR,DSN=MSS.N8067.COHORT88
//SYSIN DD *
  OPTION LINESIZE = 80 MEMSIZE = 30M NODATE;

DATA ONE;
  SET SASIN.COHORT88(READ=TRACK);

IF ACCESSVC = 2;
IF ENLTERM = 4;
IF ENTRYAGE >= 17 AND ENTRYAGE <= 31;
IF AFQTGRPS > 0;
IF ENLOPT > 0;
IF CDISTRCT > 0;
IF HIYREDUC > 0;
IF SEX > 0;
IF RACE > 0;
IF MARST_DP > 0;
IF ENTRSTAT > 0;
IF ENTRGRAD > 0 AND ENTRGRAD <= 6;
IF ETHNIC > 0;

ENTRY_M = ENTRYDTY*12 + ENTRYDTM;

IF ENTRY_M >= 1054 AND ENTRY_M <= 1065;
SEP_M = SEPDAT_Y*12 + SEPDAT_M;
```

```
IF SEP_M >= 1 THEN STAY_M = SEP_M - ENTRY_M;
ELSE IF SEP_M = 0 AND ENTRYDTM >= 10
    THEN STAY_M = (10 * 12 + 10) + (12 - ENTRYDTM);
ELSE IF SEP_M = 0 AND ENTRYDTM < 10
    THEN STAY_M = (10 * 12 + 1) + (9 - ENTRYDTM);

IF STAY_M >= 49 THEN RENL1 = 1; ELSE RENL1 = 0;

IF CDISTRCT = 1 THEN NOREAST = 1; ELSE NOREAST = 0;
IF CDISTRCT = 2 THEN CENTRAL = 1; ELSE CENTRAL = 0;
IF CDISTRCT = 3 THEN SOUTH = 1; ELSE SOUTH = 0;
IF CDISTRCT = 4 THEN WEST = 1; ELSE WEST = 0;
IF CDISTRCT = 5 THEN OTHEAREA= 1; ELSE OTHEAREA = 0;

IF ENTRYAGE = 17 THEN YOUTH = 1; ELSE YOUTH = 0;
IF ENTRYAGE >= 18 AND ENTRYAGE <= 20 THEN MIDAGE = 1;
ELSE MIDAGE = 0;
IF ENTRYAGE >= 21 THEN OLD = 1; ELSE OLD = 0;

IF HIYREDUC <= 5 THEN NHSGD = 1; ELSE NHSGD = 0;
IF HIYREDUC = 6 THEN HSGD = 1; ELSE HSGD = 0;
IF HIYREDUC >= 7 AND HIYREDUC <= 12 THEN COLLEGE = 1;
ELSE COLLEGE = 0;
IF HIYREDUC = 13 OR HIYREDUC = 14 THEN GED = 1; ELSE GED = 0;

IF SEX = 1 THEN MALE = 1; ELSE MALE = 0;
IF SEX = 2 THEN FEMALE = 1; ELSE FEMALE = 0;

IF RACE = 1 THEN WHITE = 1; ELSE WHITE = 0;
IF RACE = 2 THEN BLACK = 1; ELSE BLACK = 0;
IF RACE = 3 THEN OTHERACE = 1; ELSE OTHERACE = 0;

IF MARST_DP = 10 THEN SNDEP = 1; ELSE SNDEP = 0;
```

```
IF MARST_DP >= 11 AND MARST_DP <= 19 OR MARST_DP >= 21 AND
  MARST_DP <= 29 THEN PWDEP = 1; ELSE PWDEP = 0;
IF MARST_DP = 20 THEN MNDEP = 1; ELSE MNDEP = 0;

IF AFQTGRPS = 8 THEN CATI = 1; ELSE CATI = 0;
IF AFQTGRPS = 7 THEN CATII = 1; ELSE CATII = 0;
IF AFQTGRPS = 6 THEN CATIIIA = 1; ELSE CATIIIA = 0;
IF AFQTGRPS >= 1 AND AFQTGRPS <= 5 THEN CATIIIB = 1;
  ELSE CATIIIB = 0;

IF PRIORSVC = 1 THEN NONPSERV = 1; ELSE NONPSERV = 0;
IF PRIORSVC > 1 THEN PSERV = 1; ELSE PSERV = 0;

IF ENTRSTAT = 2 THEN FROMDEP = 1; ELSE FROMDEP = 0;
IF ENTRSTAT NE 2 THEN NFROMDEP = 1; ELSE NFROMDEP = 0;

IF ENLOPT >= 1 AND ENLOPT <= 7 THEN ADVGRADE = 1;
  ELSE ADVGRADE = 0;
IF ENLOPT >= 8 AND ENLOPT <= 14 THEN ACCPROMO = 1;
  ELSE ACCPROMO = 0;
IF ENLOPT = 15 OR ENLOPT >= 18 AND ENLOPT <= 20 THEN GUATRAIN = 1;
  ELSE GUATRAIN = 0;
IF ENLOPT >= 16 AND ENLOPT <= 17 THEN GEOGRAPH = 1;
  ELSE GEOGRAPH = 0;
IF ENLOPT = 21 THEN OTHEROPT = 1; ELSE OTHEROPT = 0;

REENLIST = 1 - RENL1;

PROC LOGISTIC;
  MODEL REENLIST = NOREST CENTRAL WEST GED HSGD COLLEGE YOUTH OLD
    FEMALE BLACK OTHERACE PWDEP MNDEP PSERV FROMDEP
    CATII  CATIIIA  ADVGRADE  ACCPROMO  GUATRAIN
    GEOGRAPH;
/*
```

## APPENDIX B. FREQUENCY IN UNLIMITED DATASETS

### A. 1979 COHORT

#### 1. Census District

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
None	423	0.5	423	0.5
North East	18,823	22.3	19,246	22.8
North Central	20,078	23.8	39,324	46.6
South	29,076	34.5	68,400	81.1
West	15,280	18.1	83,680	99.2
Other	654	0.8	84,334	100

#### 2. Entry Age

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
8	1	0	1	0
9	4	0	5	0
10	2	0	7	0
12	1	0	8	0
15	1	0	9	0
16	2	0	11	0
17	12,612	15	12,623	15
18	28,391	33.7	41,014	48.6
19	15,659	18.6	56,673	67.2
20	7,778	9.2	64,451	76.4
21	4,836	5.7	69,287	82.2
22	3,729	4.4	73,016	86.6
23	2,951	3.5	75,967	90.1
24	2,214	2.6	78,181	92.7
25	1,628	1.9	79,809	94.6
26	1,130	1.3	80,939	96
27	901	1.1	81,840	97
28	740	0.9	82,580	97.9
29	526	0.6	83,106	98.5
30	416	0.5	83,522	99

31	240	0.3	83,762	99.3
32	171	0.2	83,933	99.5
33	100	0.1	84,033	99.6
34	79	0.1	84,112	99.7
35	64	0.1	84,176	99.8
36	51	0.1	84,227	99.9
37	28	0	84,255	99.9
38	19	0	84,274	99.9
39	15	0	84,289	99.9
40	3	0	84,292	100
41	11	0	84,303	100
42	3	0	84,306	100
43	2	0	84,308	100
44	2	0	84,310	100
46	1	0	84,311	100
78	4	0	84,315	100
79	19	0	84,334	100

### 3. Highest Year of Education

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
None	48	0.1	48	0.1
1-7 Years	72	0.1	120	0.1
8 Years	578	0.7	698	0.8
1 Yr. High School	2,265	2.7	2,963	3.5
2 Yr. High School	4,842	5.7	7,805	9.3
3-4 Yr. High School	8,118	9.6	15,923	18.9
High School Diploma	56,411	66.9	72,334	85.8
1 Yr. College	2,615	3.1	74,949	88.9
2 Yr. College	2,056	2.4	77,005	91.3
3-4 Yr. College	778	0.9	77,783	92.2
College Degree	664	0.8	78,447	93
Master's Degree	31	0	78,478	93.1
Doctorate Degree	4	0	78,482	93.1
High School GED	5,852	6.9	84,334	100

#### 4. Sex

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
None	111	0.1	111	0.1
Male	75,131	89.1	75,242	89.2
Female	9,092	10.8	84,334	100

#### 5. Race

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
None	128	0.2	128	0.2
White	68,426	81.1	68,554	81.3
Black	13,185	15.6	81,739	96.9
Other	2,595	3.1	84,334	100

#### 6. Marital/Dependent Status

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
None	52	0.1	52	0.1
Single-No Dependents	78,073	92.6	78,125	92.6
Single-One Dependent	270	0.3	78,395	93
Single-Two Dependents	80	0.1	78,475	93.1
Single-Three Dependents	6	0	78,481	93.1
Single-Four Dependents	5	0	78,486	93.1
Single-Six Dependents	1	0	78,487	93.1
Married-No Dependents	3,726	4.4	82,213	97.5
Married-One Dependent	880	1	83,093	98.5
Married-Two Dependents	831	1	83,924	99.5
Married-Three Dependents	301	0.4	84,225	99.9
Married-Four Dependents	80	0.1	84,305	100
Married-Five Dependents	25	0	84,330	100
Married-Six Dependents	4	0	84,334	100

## 7. AFQT Group

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
None	3,892	4.6	3,892	4.6
1-9	59	0.1	3,951	4.7
10-15	2,901	3.4	6,852	8.1
16-20	4,106	4.9	10,958	13
21-30	11,270	13.4	22,228	26.4
31-49	22,621	26.8	44,849	53.2
50-64	13,673	16.2	58,522	69.4
65-92	21,123	25	79,645	94.4
93-99	4,689	5.6	84,334	100

## 8. Service of Accession

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Navy	68,845	81.6	68,845	81.6
Navy Reserve	15,489	18.4	84,334	100

## 9. Prior Service

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Non-Prior Service	76,980	91.3	76,980	91.3
Prior Service-Army	836	1	77,816	92.3
Prior-Service Navy	1,663	2	79,479	94.2
Prior Service-Air Force	227	0.3	79,706	94.5
Prior Service-Marine Corps	252	0.3	79,958	94.8
Other	8	0	79,966	94.8
Other	4,368	5.2	84,334	100

## 10. Entry Status

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
None	143	0.2	143	0.2
Direct to Active Duty	20,673	24.5	20,816	24.7
From DEP, CACHE, etc.	52,893	62.7	73,709	87.4
Reservist to Active Duty	10,550	12.5	84,259	99.9
Into DEP	75	0.1	84,334	100

## 11. Enlistment Term

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
None	211	0.3	211	0.3
1	47	0.1	258	0.3
2	3,196	3.8	3,454	4.1
3	382	0.5	3,836	4.5
4	62,760	74.4	66,596	79
5	164	0.2	66,760	79.2
6	17,573	20.8	84,333	100
9	1	0	84,334	100

## 12. Entry Grade

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
None	216	0.3	216	0.3
E-1	57,886	68.6	58,102	68.9
E-2	4,313	5.1	62,415	74
E-3	18,727	22.2	81,142	96.2
E-4	1,699	2	82,841	98.2
E-5	1,076	1.3	83,917	99.5
E-6	385	0.5	84,302	100
E-7	31	0	84,333	100
E-9	1	0	84,334	100

### 13. Enlistment Options

ENLOPT	Frequency	Percent	Cumulative	Cumulative
			Frequency	Percent
None	18,213	21.6	18,213	21.6
AG+TS+UG+BP	138	0.2	18,351	21.8
AG+UG+BP	21	0	18,372	21.8
AG+UG	514	0.6	18,886	22.4
AG	2,152	2.6	21,038	24.9
AG+UG+TS	73	0.1	21,111	25
AG Guarantee	10,822	12.8	31,933	37.9
AG+BP	101	0.1	32,034	38
AP+TS+UG+BP	2	0	32,036	38
AP+UG+BP	3	0	32,039	38
AP+UG	78	0.1	32,117	38.1
AP	110	0.1	32,227	38.2
AP+BP+TS	266	0.3	32,493	38.5
AP+TS	5,885	7	38,378	45.5
AP+BP	21	0	38,399	45.5
TS+UG+BP	41	0	38,440	45.6
UG+BP	354	0.4	38,794	46
UG	4,033	4.8	42,827	50.8
TS+UG	444	0.5	43,271	51.3
TS+BP	1,453	1.7	44,724	53
TS	925	1.1	45,649	54.1
Other	38,685	45.9	84,334	100

### 14. Entry Month/Year

	Frequency	Percent	Cumulative	Cumulative
			Frequency	Percent
None	120	0.1	120	0.1
05/04	1	0	121	0.1
12/04	1	0	122	0.1
11/11	29	0	151	0.2
11/21	1	0	152	0.2
10/77	2	0	154	0.2
19/77	2	0	156	0.2
12/77	11	0	167	0.2

01/78	18	0	185	0.2
02/78	39	0	224	0.3
03/78	72	0.1	296	0.4
04/78	66	0.1	362	0.4
05/78	64	0.1	426	0.5
06/78	52	0.1	478	0.6
07/78	82	0.1	560	0.7
08/78	163	0.2	723	0.9
09/78	294	0.3	1,017	1.2
10/78	7,333	8.7	8,350	9.9
11/78	5,700	6.8	14,050	16.7
12/78	5,144	6.1	19,194	22.8
01/79	7,574	9	26,768	31.7
02/79	6,273	7.4	33,041	39.2
03/79	5,911	7	38,952	46.2
04/79/	5,159	6.1	44,111	52.3
05/79	5,406	6.4	49,517	58.7
06/79	8,669	10.3	58,186	69
07/79	8,536	10.1	66,722	79.1
08/79	9,528	11.3	76,250	90.4
09/79	8,074	9.6	84,324	100
10/79	2	0	84,326	100
11/79	1	0	84,327	100
12/79	4	0	84,331	100
03/89	2	0	84,333	100
11/89	1	0	84,334	100

## B. 1988 COHORT

### 1. Census District

	Frequency	Percent	Cumulative	
			Frequency	Percent
None	655	0.7	655	0.7
North East	15,320	16.4	15,975	17.1
North Central	24,447	26.2	40,422	43.3
South	34,127	36.6	74,549	79.9
West	18,614	19.9	93,163	99.8
Other	175	0.2	93,338	100

## 2. Entry Age

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
17	6,245	6.7	6,245	6.7
18	32,345	34.7	38,590	41.3
19	19,928	21.4	58,518	62.7
20	10,129	10.9	68,647	73.5
21	6,122	6.6	74,769	80.1
22	4,311	4.6	79,080	84.7
23	3,398	3.6	82,478	88.4
24	2,743	2.9	85,221	91.3
25	1,994	2.1	87,215	93.4
26	1,381	1.5	88,596	94.9
27	1,035	1.1	89,631	96
28	850	0.9	90,481	96.9
29	698	0.7	91,179	97.7
30	576	0.6	91,755	98.3
31	427	0.5	92,182	98.8
32	366	0.4	92,548	99.2
33	301	0.3	92,849	99.5
34	247	0.3	93,096	99.7
35	82	0.1	93,178	99.8
36	37	0	93,215	99.9
37	29	0	93,244	99.9
38	28	0	93,272	99.9
39	20	0	93,292	100
40	23	0	93,315	100
41	7	0	93,322	100
42	6	0	93,328	100
43	4	0	93,332	100
44	1	0	93,333	100
45	1	0	93,334	100
46	2	0	93,336	100
47	2	0	93,338	100

### 3. Highest Year of Education

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
None	66	0.1	66	0.1
1-7 Years	26	0	92	0.1
8 Years	145	0.2	237	0.3
1 Yr. High School	725	0.8	962	1
2 Yr. High School	1,495	1.6	2,457	2.6
3-4 Yr. High School	2,018	2.2	4,475	4.8
High School Diploma	82,787	88.7	87,262	93.5
1 Yr. College	102	0.1	87,364	93.6
2 Yr. College	774	0.8	88,138	94.4
3-4 Yr. College	105	0.1	88,243	94.5
College Degree	960	1	89,203	95.6
Master's Degree	52	0.1	89,255	95.6
Doctorate Degree	10	0	89,265	95.6
High School GED	3,890	4.2	93,155	99.8
Alternate Credentials	183	0.2	93,338	100

### 4. Sex

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Male	83,229	89.2	83,229	89.2
Female	10,109	10.8	93,338	100

### 5. Race

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
None	39	0	39	0
White	70,430	75.5	70,469	75.5
Black	18,749	20.1	89,218	95.6
Other	4,120	4.4	93,338	100

## 6. Marital/Dependent Status

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
None	141	0.2	141	0.2
Single-No Dependents	86,267	92.4	86,408	92.6
Single-One Dependent	19	0	86,427	92.6
Single-Two Dependents	5	0	86,432	92.6
Single-Six Dependents	1	0	86,433	92.6
Married-No Dependents	6,773	7.3	93,206	99.9
Married-One Dependent	31	0	93,237	99.9
Married-Two Dependents	45	0	93,282	99.9
Married-Three Dependents	40	0	93,322	100
Married-Four Dependents	14	0	93,336	100
Married-Five Dependents	2	0	93,338	100

## 7. AFQT Group

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
None	3,476	3.7	3,476	3.7
10-15	10	0	3,486	3.7
16-20	26	0	3,512	3.8
21-30	8,582	9.2	12,094	13
31-49	26,517	28.4	38,611	41.4
50-64	19,869	21.3	58,480	62.7
65-92	30,513	32.7	88,993	95.3
93-99	4,345	4.7	93,338	100

## 8. Service of Accession

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Navy	74,878	80.2	74,878	80.2
Navy Reserve	18,460	19.8	93,338	100

## 9. Prior Service

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Non-Prior Service	87,775	94	87,775	94
Other	5,563	6	93,338	100

## 10. Entry Status

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
None	99	0.1	99	0.1
Direct to Active Duty	1,293	1.4	1,392	1.5
From DEP, CACHE, etc.	74,982	80.3	76,374	81.8
Reservist to Active Duty	16,952	18.2	93,326	100
Into DEP	12	0	93,338	100

## 11. Enlistment Term

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	43	0	43	0
1	146	0.2	189	0.2
2	1,501	1.6	1,690	1.8
3	267	0.3	1,957	2.1
4	72,079	77.2	74,036	79.3
5	131	0.1	74,167	79.5
6	1,026	1.1	75,193	80.6
7	5	0	75,198	80.6
8	18,139	19.4	93,337	100
9	1	0	93,338	100

## 12. Entry Grade

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
None	45	0	45	0
E-1	71,904	77	71,949	77.1
E-2	5,522	5.9	77,471	83
E-3	12,390	13.3	89,861	96.3
E-4	1,812	1.9	91,673	98.2
E-5	1,182	1.3	92,855	99.5
E-6	441	0.5	93,296	100
E-7	28	0	93,324	100
E-9	6	0	93,330	100
E-10	1	0	93,331	100
E-11	6	0	93,337	100
E-12	1	0	93,338	100

## 13. Enlistment Options

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
None	18,067	19.4	18,067	19.4
AG+TS+UG+BP	27	0	18,094	19.4
AG+UG+BP	5	0	18,099	19.4
AG+UG	101	0.1	18,200	19.5
AG	1,594	1.7	19,794	21.2
AG+UG+TS	43	0	19,837	21.3
AG Guarantee	6,177	6.6	26,014	27.9
AG+BP	40	0	26,054	27.9
AP+TS+UG+BP	1	0	26,055	27.9
AP+UG+BP	1	0	26,056	27.9
AP+UG	1	0	26,057	27.9
AP	10	0	26,067	27.9
AP+BP+TS	46	0	26,113	28
AP+TS	10,338	11.1	36,451	39.1
AP+BP	2	0	36,453	39.1
TS+UG+BP	39	0	36,492	39.1
UG+BP	27	0	36,519	39.1
UG	1,739	1.9	38,258	41

TS+UG	977	1	39,235	42
TS+BP	321	0.3	39,556	42.4
TS	201	0.2	39,757	42.6
Other	53,581	57.4	93,338	100

#### 14. Entry Month/Year

Frequency	Percent	Cumulative	
		Frequency	Percent
10/84	1	0	0
12/86	1	0	0
01/87	2	0	0
02/87	1	0	0
03/87	1	0	0
05/87	1	0	0
08/87	19	0	0
09/87	23	0	0.1
10/87	6,943	7.4	7.5
11/87	7,057	7.6	15.1
12/87	5,379	5.8	20.8
01/88	6,391	6.8	27.7
02/88	6,708	7.2	34.8
03/88	6,873	7.4	42.2
04/88	6,015	6.4	48.7
05/88	5,897	6.3	55
06/88	9,655	10.3	65.3
07/88	10,381	11.1	76.4
08/88	11,303	12.1	88.6
09/88	10,687	11.4	100



## APPENDIX C. LOGIT MODEL VARIABLES

TITLE	VARIABLE	DESCRIPTION	EXPECTED SIGN
CENSUS DISTRICT	SOUTH	SOUTH & OTHER AREA	REFERENCE
	NOREAST	NORTH EAST AREA	-
	CENTRAL	NORTH CENTRAL AREA	-
	WEST	WEST AREA	-
EDUCATION	NHSGD	NON HIGH SCHOOL GRADUATED	REFERENCE
	GED	HIGH SCHOOL G.E.D	+
	HSGD	HIGH SCHOOL DIPLOMA	+
	COLLEGE	EDUCATION > HIGH SCHOOL	+
AGE AT ENTRY	YOUTH	ENTRY AGE = 17	-
	MIDAGE	ENTRY AGE >= 18 AND <= 20	REFERENCE
	OLD	ENTRY AGE >= 21	+
SEX	MALE	MALE	REFERENCE
	FEMALE	FEMALE	-
RACE	WHITE	WHITE	REFERENCE
	BLACK	BLACK	+
	OTHERACE	OTHER RACE	+
MARITAL	SNDEP	SINGLE NO DEPENDENTS	REFERENCE
	PWDEP	PERSON WITH DEPENDENTS	+
	MNDEP	MARRIED NO DEPENDENTS	+
PRIOR SERVICE	NONPSSRV	NON-PRIOR SERVICE	REFERENCE
	PSERV	PRIOR SERVICE	+

ENTRY STATUS	NFROMDEP FROMDEP	NON-FROM DEP,CACHE,ETC FROM DEP,CACHE,ETC	REFERENCE
			+
AFQT CATEGORY	CATI CATII CATIIIA CATIIIB	AFQT CATEGORY 93%--99% AFQT CATEGORY 65%--92% AFQT CATEGORY 50%--64% AFQT CATEGORY 1%--49%	+
			REFERENCE
ENLISTMENT OPTION	OTHEROPT ADVGRADE ACCPROMO GUATRAIN GEOGRAPH	OTHER ENLISTMENT OPTION ADVANCED ENLISTMENT GRADE ACCELERATED PROMOTION TRAINING OR SKILL GUARANTEE UNIT OR GEOGRAPHIC LOCATION	REFERENCE
			+
			-
			-

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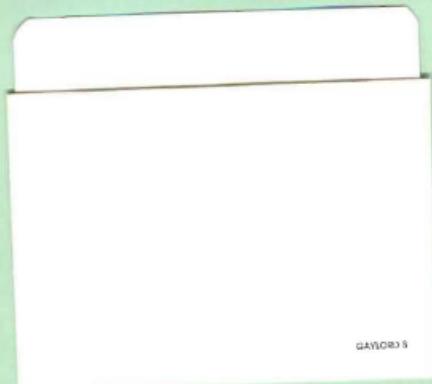
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